# Safety Sensors

**NEW PRODUCT**

**MS4800 Series**
**Safety Light Curtain**



P-246

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| Safety Sensor Product Selection | | | 238 |
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| Safety Light Curtain | | MS4800 Series NEW | 246 |
| Safety Light Curtain (Type 4) | | F3SJ Ver.2 | 282 |
| | Wire-saving Device for F3SJ | | 358 |
| | Connector Terminal Box (Muting Terminals for F3SJ-A) | F39-TC5 | 360 |
| | Safety Terminal Relays (for F3SJ-A□□□□P□□) | F3SP-T01 | 368 |
| Safety Light Curtain | | F3SN-A<br>F3SN-B | 378 |
| Multi-beam Safety Sensor | | F3SH-A | 378 |
| Safety Light Curtain/Multi-beam Safety Sensor | | F3SN-A□SS | 410 |
| Single-beam Safety Sensor | | E3ZS/E3FS | 432 |
| Single-beam Safety Sensor for Long Distance Detection | | F3SS | 448 |




**Product Discontinuation and Recommended Substitute Products**

No information on Product Discontinuation and Recommended Substitute of Safety Sensors available.

# Confirming Worker Safety while Maintaining Optimum Operability

- **All Safety Sensors conform to international standards (IEC61496).**
- **Our complete lineup provide a product for virtually any safety application, including various sensing distances, smallest detectable object sizes, and safety categories.**



For equipment and machines

Sensing Distance: 10 m max.

Narrow Openings

Wide Openings

For work cells and integrated lines

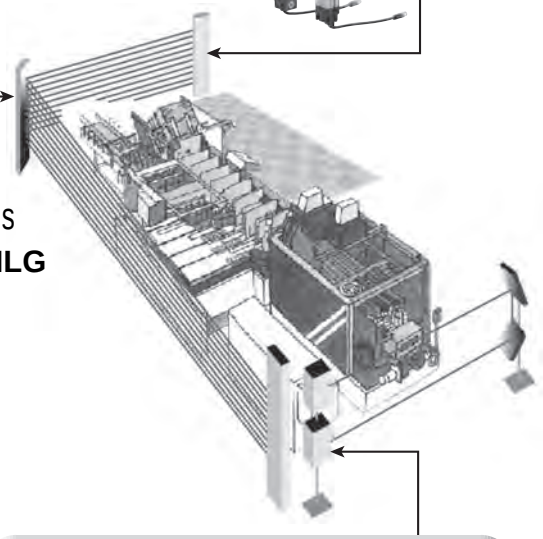
Sensing Distance: 10 m min.

## Safety Light Curtain

TYPE4 : **MS4800**

➡ 246





Mirrors
**F39-MLG**

## Single-beam Safety Sensor

TYPE4 : **F3SS**

➡ 448



## Single-beam Safety Sensor

TYPE4: **E3ZS**
Note: Use in combination with the Controller.
➡ 432



TYPE4: **E3FS**
Note: Use in combination with the Controller.
➡ 432



TYPE4: **F3SS**
Note: The sensing distance is 60 m.
➡ 448



## Safety Light Curtain

Type2 or type4 according to risk assessment

### Special Controllers



Special Controller
**F3SP-B1P**
➡ 292, 382, 416



Safety Controller
**F3SX**
➡ 652

## Safety Laser Scanner

TYPE3 : **OS3101**
➡ 458



## Finger Protection

TYPE4:
**F3SJ-A□□□□□14**
➡ 282
TYPE4:
**F3SN-A□□□□P14**
➡ 378



F3SJ Ver.2
Safety Light Curtain

## Hand Protection

TYPE4:
**F3SJ-A□□□□□20**
**F3SJ-A□□□□□25**
➡ 282
TYPE4:
**F3SN-A□□□□P25**
➡ 378
TYPE2:
**F3SN-B□□□□P25**
➡ 378
TYPE4:
**F3SN-A□□□□P25-SS**
➡ 410



F3SJ Ver.2
Safety Light Curtain

## Hand/Arm/Body Protection

TYPE4:
**F3SJ-A□□□□□30**
➡ 282
TYPE4:
**F3SN-A□□□□P40**
➡ 378
TYPE2:
**F3SN-B□□□□P40**
➡ 378



F3SJ Ver.2
Safety Light Curtain

## Leg/Body Protection

TYPE4:
**F3SJ-A□□□□□55**
➡ 282

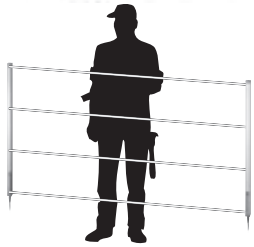


F3SJ Ver.2
Safety Light Curtain

## Body Protection

TYPE4:
**F3SN-A□□□□P70**
TYPE2:
**F3SN-B□□□□P70**
➡ 378
TYPE4:
**F3SH-A09P03**
➡ 378





# Safety Sensor Product Selection

## Safety Light Curtain Specifications

| Model | | Application | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Finger Protection | Hand Protection | Hand/Arm/ Body Protection | Leg/Body Protection | For Human Detection (No. of Beams) | Fixed Blanking | |
| MS4800 Series (Refer to page 246) | MS4800B | | | ● | | | | |
| | MSF4800B | | | ● | | | | |
| | MS4800A | | | ● | | | ● | |
| | MSF4800A | | | ● | | | ● | |
| F3SJ Ver.2 (Refer to page 282) | F3SJ-A□14 | ● | | | | | ● | |
| | F3SJ-A□20 | | ● | | | | ● | |
| | F3SJ-A□25 | | ● | | | | ● | |
| | F3SJ-A□30 | | | ● | | | ● | |
| | F3SJ-A□55 | | | | ● | | ● | |
| F3SN-A (Refer to page 378) | F3SN-A□P14-□ | ● | | | | | ● | |
| | F3SN-A□P25-□ | | ● | | | | ● | |
| | F3SN-A□P40-□ | | | ● | | | ● | |
| | F3SN-A□P70-□ | | | | | ● (5 to 30) | ● | |
| F3SN-A□SS (Refer to page 410) | F3SN-A□P25SS-□ | | ● | | | | ● | |
| F3SH (Refer to page 378) | F3SH-A09P03-□ | | | | | ● (4) | | |
| F3SN-B (Refer to page 378) | F3SN-B□P25-□ | | ● | | | | | |
| | F3SN-B□P40-□ | | | ● | | | | |
| | F3SN-B□P70-□ | | | | | ● (5 to 30) | | |

***1.** Muting Module MS4800-RM6 (sold separately) is required.

***2.** The sensing distance for the F3SJ-A□20 with 110 to 166 beams, the F3JA□25 with 83 to 125 beams, the F3SJ-A□30 with 70 to 100 beams, and the F3SJ-A□55 with 34 to 50 beams, is 7 meters.

## Single-beam Safety Sensor Specifications

| Model | | Main Unit Material | | Controller | | Safety Category | |
|---|---|---|---|---|---|---|---|
| | | Metal | Plastic | | | | |
| E3ZS (Refer to page 432) | E3ZS-T81A | | ● | Required | F3SX | 2 | |
| E3FS (Refer to page 432) | E3FS-10B4 2M | | ● | Required | F3SX | 2 | |
| | E3FS-10B4-M1-M | ● | | Required | F3SX | 2 | |
| F3SS (Refer to page 448) | F3SS-AT60P | ● | | Not required | | 4 | |

## Safety Laser Scanner Specifications

| Model | | Detection Capability | Detection Angle | Safety Category | |
|---|---|---|---|---|---|
| OS3101 (Refer to page 458) | OS3101-2-PN-S | Opaque objects : 62-mm dia. (1.8% min. reflection factor) | 180° | 3 | |

| Application | | Safety Category | Sensing Distance | |
|---|---|---|---|---|
| Floating Blanking | Muting | | | 5 m / 10 m / 20 m / 40 m / 60 m |
| | | 4 | 20 m | |
| | | 4 | 20 m | |
| ● | | 4 | 20 m | |
| ● | ●*1 | 4 | 20 m | |
| ● | ● | 4 | 9 m | |
| ● | ● | 4 | 9 m*2 | |
| ● | ● | 4 | 9 m*2 | |
| ● | ● | 4 | 9 m*2 | |
| ● | ● | 4 | 9 m*2 | |
| ● | | 4 | 7 m | |
| ● | | 4 | 10 m | |
| ● | | 4 | 10 m | |
| ● | | 4 | 10 m | |
| ● | | 4 | 3.5 m | |
| | | 4 | 10 m | |
| | | 2 | 10 m | |
| | | 2 | 10 m | |
| | | 2 | 10 m | |

| | Sensing Distance | |
|---|---|---|
| | | 5 m / 10 m / 20 m / 40 m / 60 m |
| | 3 m | |
| | 10 m | |
| | 10 m | |
| | 60 m | |

| | Sensing Distance | |
|---|---|---|
| | | 5 m / 10 m / 20 m / 40 m / 60 m |
| | Protective Area 4 m | |
| | Warning Area 15m | |

# Precautions for All Safety Sensors

**Refer to the *"Safety Precautions"* section for each Sensor for specific precautions applicable to each Sensor.**

**⚠ WARNING**

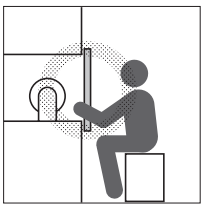
## Installation Conditions

### Detection Zone and Intrusion Path

Install a protective structure so that the hazardous part of a machine can only be reached by passing through the sensor's detection zone. Install the sensors so that part of the person is always present in the detection zone when working in a machine's hazardous areas.
If a person is able to step into the hazardous area of a machine and remain behind the Safety Light Curtain's detection zone, configure the system with an interlock function that prevents the machine from being restarted. Otherwise it may result in heavy injury.

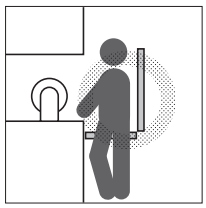


Correct Installation



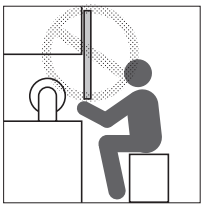
A person can only reach the hazardous part of the machinery by passing through the sensor's detection zone.

Correct Installation



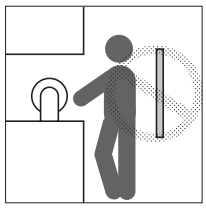
A person enters the detection zone during operation.

Incorrect Installation



A person can reach the hazardous part of the machinery without passing through the sensor's detection zone.

Incorrect Installation



A person is between the sensor's detection zone and the hazardous part of the machinery.

Install the interlock reset switch in a location that provides a clear view of the entire hazardous area and where it cannot be activated from within the hazardous area.

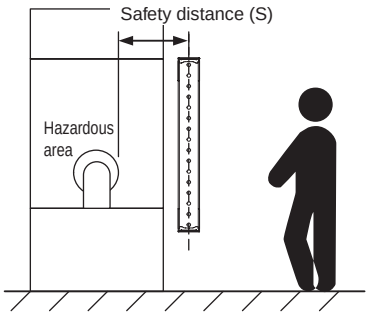


The Safety Light Curtain cannot protect a person from an object flying from a hazardous area. Install protective cover(s) or fence(s).



### Safety Distance

The safety distance is the distance that must be set between the Safety Sensor and a machine's hazardous part to stop the hazardous part before a person or object reaches it. The safety distance varies according to the standards of each country and the individual specifications of each machine. In addition, the calculation of the safety distance differs if the direction of approach is not perpendicular to the detection zone of the Safety Sensor. Always refer to relevant standards.




Make sure to secure the safety distance (S) between the Safety Sensor and the hazardous part. Otherwise, the machine may not stop before a person reaches the hazardous part, resulting in serious injury.



**Note:** The response time of a machine is the time period from when the machine receives a stop signal to when the machine's hazardous part stops.
Measure the response time on the actual system. Also, periodically check that the response time of the machine has not changed.

#### <Safety Distance for a Safety Light Curtain>

**How to calculate the safety distance specified by International standard ISO13855-2002 (European standard EN999-1999) (Reference)**

If a person approaches the detection zone of the Safety Light Curtain perpendicularly, calculate the safety distance as shown below.
S = K x T + C . . . Eq. (1)

- S: Safety distance
- K: Approach speed to the detection zone
- T: Total response time of the machine and Safety Light Curtain
- C: Additional distance calculated by the detection capability of the Safety Light Curtain

<System that has detection capability of 40 mm max.>
Use K = 2,000 mm/s and C = 8 x (d - 14 mm) in equation (1) for the calculation.
S = 2,000 mm/s x (Tm + Ts) + 8 x (d - 14 mm)

- S = Safety distance (mm)
- Tm = Machine's response time (s)
- Ts = Response time of the Safety Light Curtain from ON to OFF (s) ✻
- d = Size of Safety Light Curtain's detection capability (mm) ✻

✻ These values differ depending on the Switch. Refer to the "*Precautions for Correct Use*" for the Switch you are using.

[Calculation example]
When Tm = 0.05 s, Ts = 0.01 s, and d = 14 mm:
S = 2,000 mm/s x (0.05 s + 0.01 s) + 8 x (14 mm - 14 mm)
= 120 mm . . . Eq. (2)
If the result is less than 100 mm, use S = 100 mm.
If the result exceeds 500 mm, use the following equation where K = 1,600 mm/s.
S = 1,600 mm/s x (Tm + Ts) + 8 x (d - 14 mm) . . . Eq. (3)
If the result of this Eq. (3) is less than 500 mm, use S = 500 mm.

<Systems with a Smallest Detectable Object Size (Diameter) Greater than 40 mm or Systems Using Multi-beam Safety Sensors>

Assuming K = 1,600 mm/s and C = 850 mm, the following calculation is made using Eq. (1).

S = 1,600 mm/s x (Tm + Ts) + 850 … Eq. 4,

- S = Safety distance (mm)
- Tm = Machine's response time (s)
- Ts = Response time of the Safety Light Curtain from ON to OFF (s)

Calculation example:

When Tm = 0.05 s and Ts = 0.01 s,

S = 1,600 mm/s x (0.05 s + 0.01 s) + 850 mm = 946 mm

**How to calculate the safety distance specified by American standard ANSI B11.19**

**(Reference)**

<Systems with a Smallest Detectable Object Size (Diameter) Less than 64 mm>

If a person approaches the detection zone of the Safety Light Curtain perpendicularly, calculate the safety distance as shown below.

S = K x (Ts + Tc + Tr + Tbm) + Dpf

- S: Safety distance
- K: Approach speed to the detection zone (the value recommended by OSHA standard is 1,600 mm/s)

Approach speed K is not specified in the ANSI B.11.19 standard. To determine the value of K to apply, consider all factors, including the operator's physical ability.

- Ts = Machine's stop time (s)
- Tr = Response time of the Safety Light Curtain from ON to OFF (s)
- Tc = Machine control circuit's maximum response time required to activate its brake (s)
- Tbm = Additional time (s)

If a machine has a brake monitor, "Tbm = Brake monitor setting time - (Ts + Tc)". If it has no brake monitor, we recommend using 20% or more of (Ts + Tc) as additional time.

- Dpf = Additional distance

According to ANSI's formula, Dpf is calculated as shown below:

Dpf = 3.4 x (d - 7.0): Where d is the detection capability of the Safety Light Curtain (unit: mm)

[Calculation example]

When K = 1,600 mm/s, Ts + Tc = 0.06 s, brake monitor setting time = 0.1 s, Tr = 0.01 s, d = 14 mm:

Tbm = 0.1 - 0.06 = 0.04 s

Dpf = 3.4 x (14 - 7.0) = 23.8 mm

S = 1,600 x (0.06 + 0.01 + 0.04) + 23.8 = 199.8 mm

**Method for Calculating the Safety Distance as Provided by ANSI/RIA R15.06 (USA)**

**(Reference)**

<Systems with a Smallest Detectable Object Size (Diameter) Greater than 64 mm and Less than 600mm>

The safety distance is calculated based on the following concepts when the human body intrudes perpendicular to the detection zone of the Safety Light Curtain.

S = K x (Ts + Tc + Tr ) + Dpf

- S: Safety distance
- K = Intrusion speed into detection zone (1,600 mm/s min. recommended by OSHA)
- Ts = Stop time of machine/equipment (s)
- Tr = Light curtain ON-to-OFF response time (s)
- Tc = Maximum response time of the machine/equipment braking circuit required to operate the brake (s)
- Dpf = Additional distance (mm)

If the Sensor is installed with the lowest beam height above the floor at 300 mm or lower and the highest beam height above the floor at 1,200 mm or higher, the Dpf will be 900 mm.

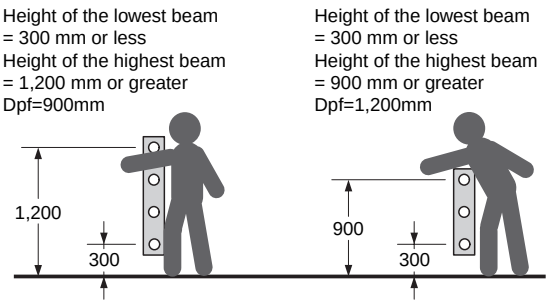
If the Sensor is installed with the lowest beam height above the floor at 300 mm or lower and the highest beam height above the floor at 900 mm or higher, the Dpf will be 1,200 mm.

[Calculation example]

K = 1,600 mm/s, Ts + Tc = 0.06s,

If Tr = 0.01 s and Dpf = 900 mm:

S = 1,600 x (0.06 + 0.01) + 900 = 1,012 mm




**<Safety Distance for a Single-beam Safety Sensor>**

**How to calculate the safety distance specified by International standard ISO13855-2002 (European standard EN999-1999)**

**(Reference)**

**(With Intrusion Perpendicular to the Detection Zone)**

Safety distance (S) = Intrusion speed into the detection zone (K) x Total response time for the machine and Sensor (T) + Additional distance calculated based on the detection capability of the Sensor (C)

The safety distance varies with national standards and individual machine standards. The equation is also different if the direction of intrusion is not perpendicular to the detection zone of the Sensor. Be sure to refer to related standards.

Here T = T1 + T2 + T3

Where

T1 = Maximum machine stop time (s)

T2 = Sensor response time (s)

(From ON to OFF: 2.0 ms for the E3FS, 1.0 ms for the E3ZS, 35 ms for the F3SS)

T3 = F3SX response time (s)

(From ON to OFF: Refer to Response Time on page 659.)

The maximum stop time for a machine is the time it takes to actually stop dangerous parts after the machine receives a stop signal from the F3SX.

**⚠ WARNING**

Measure the actual maximum stop time for the machine and the periodically check it to see if the time changes.



- K and C are as follows for Single-beam Safety Sensors.

1. When a Single-beam Safety Sensor is used alone (when the risk assessment indicates that a single beam is sufficient)
   K = 1,600 mm/s
   C = 1,200 mm
   Height of the beam from the ground or from a reference surface: 750 mm (EN999 recommendation)
2. When multiple Single-beam Safety Sensors are installed at different heights.
   K = 1,600 mm/s
   C = 850 mm
   The beam heights in the following table are the EN999 recommendations.

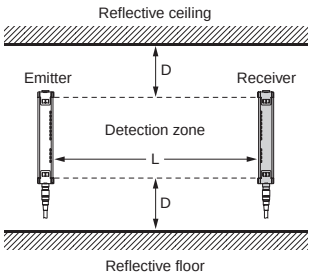
| No. of beams | Height from the reference surface (example: the floor) |
|---|---|
| 2 | 400 mm, 900 mm |
| 3 | 300 mm, 700 mm, 1100 mm |
| 4 | 300 mm, 600 mm, 900 mm, 1200 mm |

### Distance from Glossy Surface

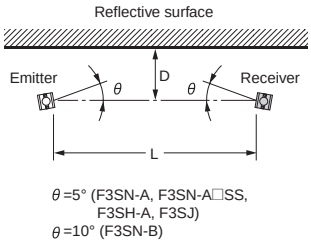
Install the sensor system so that it is not affected by reflection from a glossy surface. Failure to do so may hinder detection, resulting in serious injury.

Install the sensor system at distance D or further from highly reflective surfaces such as metallic walls, floors, ceilings, or workpieces, as shown below.

<Side View>




<Top View>




θ =5° (F3SN-A, F3SN-A□SS, F3SH-A, F3SJ)
θ =10° (F3SN-B)

| Distance between emitter and receiver (Detection Distance) | Allowable installation distance D | |
|---|---|---|
| | Type 4 | Type 2 |
| For 0.2 to 3 m | 0.13 m | 0.26 m |
| For 3 m or more | L/2 x tan5°<br>= L x 0.044 (m) | L/2 x tan10°<br>= L x 0.088 (m) |

### Others

To use the Safety Light Curtain in PSDI mode (restart of cycle operation by the sensor), you must configure an appropriate circuit between the Safety Light Curtain and the machine. For details about PSDI, refer to OSHA1910.217, IEC61496-1, and other relevant standards and regulations.

Do not try to disassemble, repair, or modify this product. Doing so may cause the safety functions to stop working properly.

Do not use the Safety Light Curtain in environments where flammable or explosive gases are present. Doing so may result in explosion.

Perform daily and 6-month inspections for the Safety Light Curtain. Otherwise, the system may fail to work properly, resulting in serious injury.

## Installation

### Prevention of Mutual Interference

The emitter and the receiver to be set facing each other should be a pair of the same set. Erroneous combination may create a zone where objects cannot be detected.

Do not use a sensor system in a reflective configuration. Doing so may hinder detection.
Mirrors can be used change the optical route.

When using more than 1 set of Safety Light Curtain, install them so that mutual interference does not occur, such as by configuring series connections or using physical barriers between adjacent sets.

## Precautions for Safe Use

Do not used the product in atmospheres or environments that exceed product ratings

# Installation

## Prevention of Mutual Interference

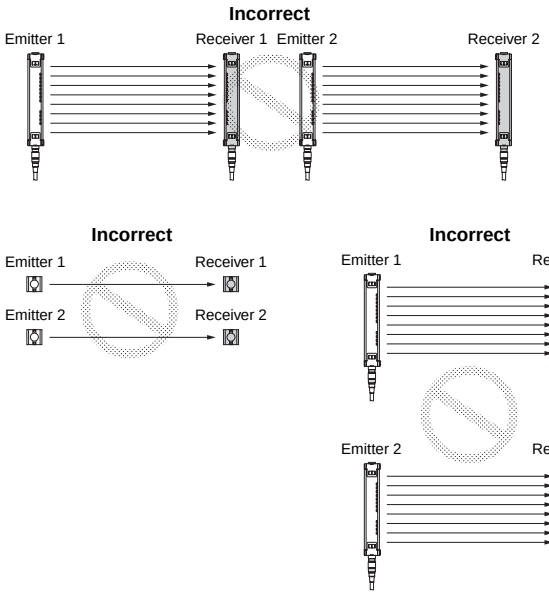
### For series connection

Refer to the "*Precautions for Correct Use*" for individual models for information on preventing mutual interference of linkable Safety Light Curtains.

### For no series connection

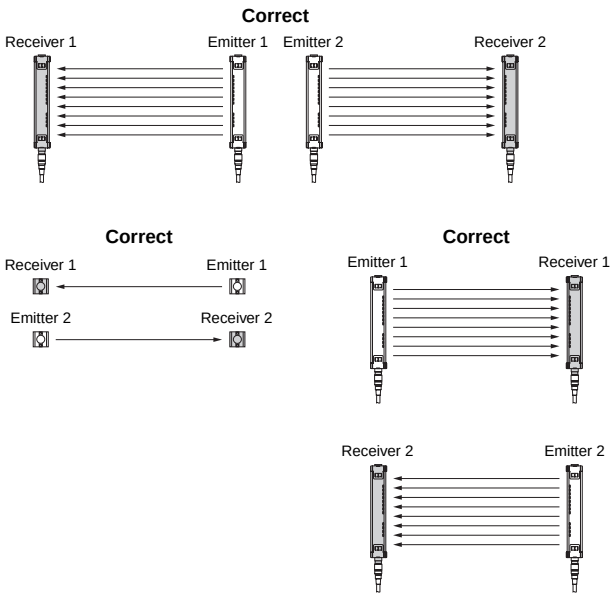
When installing two or more pairs of light curtains independently from each other due to inconvenience of wiring or other reason, take proper measures to prevent mutual interference. If mutual interference occurs, a lockout condition will result for the Safety Light Curtain.

- Installation which may cause mutual interference

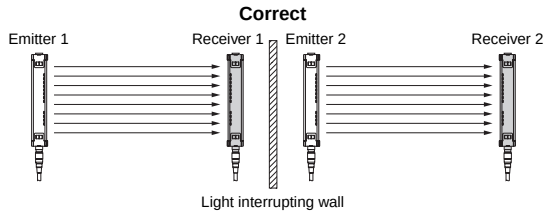



- Installation to prevent mutual interference

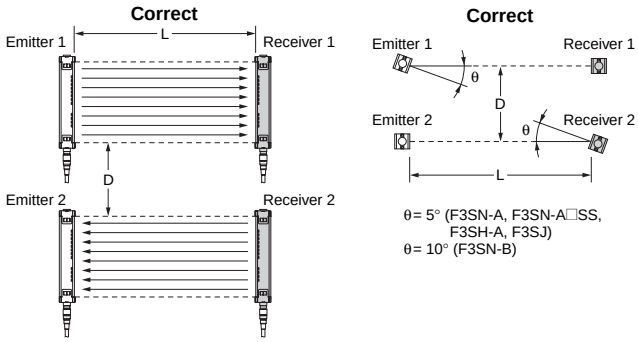
(1)Install so that the two light curtains emit in the opposite directions (staggered).




(2)Install a light interrupting wall in between sensors.




(3)Install the light curtains facing away from the one another to eliminate mutual interference.



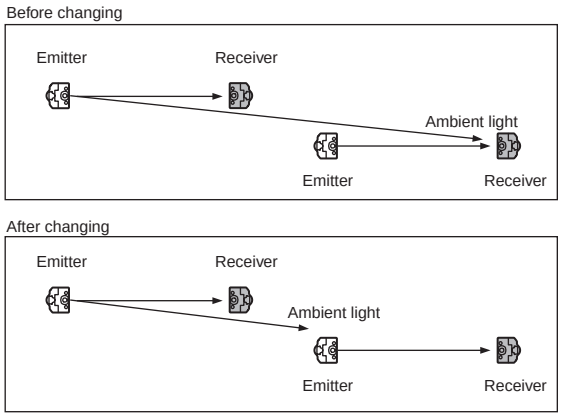

| Distance between emitter and receiver (Detection Distance) | Allowable installation distance D | |
|---|---|---|
| | Type 4 | Type 2 |
| For 0.2 to 3 m | 0.26 m | 0.52 m |
| For 3 m or more | L x tan5°<br>= L x 0.088 (m) | L x tan10°<br>= L x 0.18 (m) |

**Operating range**

Chattering may occur in the output when the distance between the emitter and the receiver is less than 0.2 m. Use only in the rated operating range.

(4)Use a spatter protection slit cover. (F3SN and F3SH)

(5)Shorten the detection distance by setting with a setting tool. (F3SJ)



# MS4800 Series

## Safety Light Curtains with Durable, Impact-resistant Body and Long, 20-m Sensing Distance



NEW

### MS/MSF4800A Advanced Series

- Programming and Diagnostics Module (PDM) makes it easy to set functions.
- Series connection is possible only with the MSF4800A.
- Blanking can be set.
- Muting is possible only with the MSF4800A by using the MS4800-RM6 Resource Module.

### MS/MSF4800B Basic Series

- Features all necessary basic Safety Light Curtain functions.
- Series connection is possible only with the MSF4800B.
- Programming and Diagnostics Module (PDM) makes it easy to set functions.

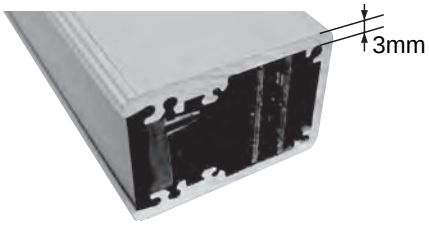
Be sure to read the *Precautions for Safe Use* on page 273.



## Features

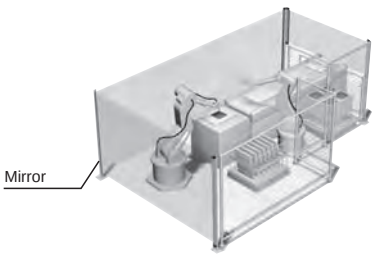
### Durable Housing with a Thickness of 3 mm Min. Withstands Vibration and Impacts

Unlike conventional Safety Light Curtains, the MS4800 Series uses a thick aluminum case (3 mm at its thinnest parts).
This makes it ideal for applications with considerable vibration or impacts.




### Long Maximum Sensing Distance of 20 m

The long, 20-m maximum sensing distance of the MS4800 Series marks the highest level in the industry.
Even in applications where large, complicated machines are guarded, the use of mirrors can reduce the number of Safety Light Curtains required.




### A Wide Lineup for a Variety of Applications

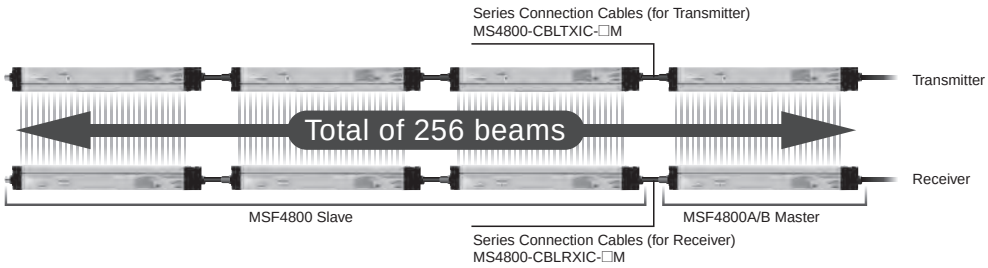
Two series are available to meet your needs: the Advanced Series with sophisticated functions and the Basic Series with specialized, basic functions.

| | Minimum detectable object | Beam gap | Protective height |
|---|---|---|---|
| **Advanced Series MS/MSF4800A** | 30-mm diameter | 20 mm | 280 to 2,120 mm |
| | 40-mm diameter | 30 mm | 360 to 2,040 mm |
| **Basic Series MS/MSF4800B** | 30-mm diameter | 20 mm | 280 to 2,120 mm |
| | 40-mm diameter | 30 mm | 360 to 2,040 mm |

## Series Connection of Up to Four Systems with No Controller Necessary

**(Allowing a total of 256 beams max.) (MSF4800 only)**

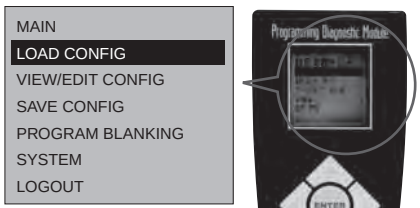
Up to four systems can be connected in series (for a total of 256 beams) without having to connect a controller. Models for which the smallest detectable object is different can even be connected to respond flexibly to virtually any application.




## Intuitive Operation with the Programming and Diagnostics Module (PDM)

Complete with an LCD that displays in either English or Japanese, the PDM makes it easy and intuitive to program, change settings, and troubleshoot the MS4800 Series.

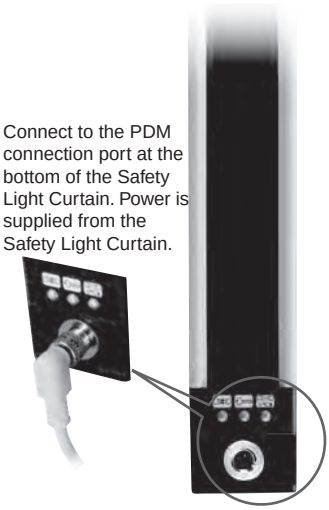
- Easy operation with five function buttons.
- Allows setting changes and status monitoring.
- IP65 protection.
- Safety outputs operate while the PDM is connected, making it possible to monitor during operation.




The interactive menu simplifies operation.
(The Safety Light Curtain settings must be loaded in advance.)

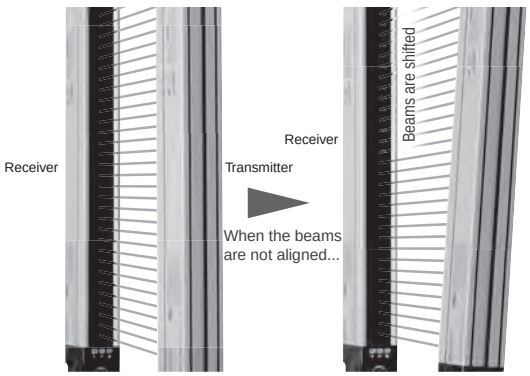



Connect to the PDM connection port at the bottom of the Safety Light Curtain. Power is supplied from the Safety Light Curtain.



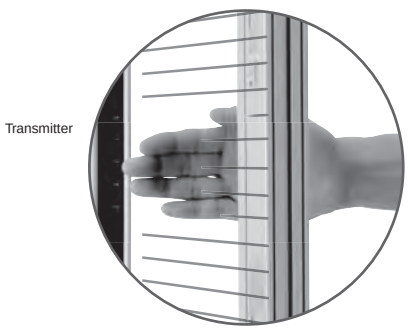
## Easy-to-understand Individual Beam Indicators (IBI)

The MS4800-series Receiver is equipped with OMRON STI's unique Individual Beam Indicator (IBI) function. When a beam is interrupted, or when it is out of alignment, an individual LED lights at each corresponding Receiver beam position to notify the operator. This makes it easy to align beams even from a distance. An error code is also displayed when an error is occurs. (This function is provided only on the Receiver.)




When the beams are aligned, all IBIs turn OFF.

The IBIs turn ON at the positions where the beams are shifted.




The IBIs turn ON at the positions where the beams are interrupted. This notifies the operator that the beams are interrupted.

## Four Blanking Functions for Disabling Beams (Advanced series only)

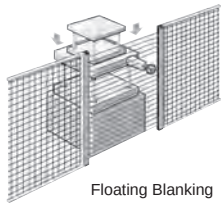
When a machine or a workpiece is present inside the sensing area of the Safety Light Curtain, the output turns OFF and the machine cannot be started.
However, a blanking function can be used to disable the appropriate beams of the Safety Light Curtain and allow work to continue without stopping the machine. The MS4800 Series provides four blanking functions to combine both safety and productivity in a wide range of applications.



Fixed Blanking

### Fixed Blanking

This function is used when a machine or workpiece constantly interrupts beams in a part of the sensing area. Fixed Blanking allows the Safety Light Curtain to remain in the RUN state while the obstruction is fixed (as a non-moving object) within the sensing area. The output is turned OFF when a beam other than the set fixed blanking beams is interrupted, or when light is incident on a fixed blanking beam.



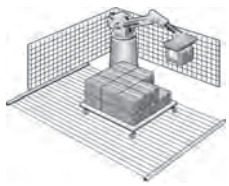
Floating Blanking

### Floating Blanking

This function turns OFF the output when the total number of interrupted beams inside the sensing area exceeds the number of set beams (1 or 2).

### Monitored Blanking

This function is used when a machine or workpiece constantly interrupts beams in a part of the sensing area and moves within the sensing area. Monitored Blanking allows the Safety Light Curtain to remain in the RUN state while the obstruction moves within the sensing area. The output is turned OFF when the machine or workpiece disappears from the monitored blanking area that was set by teaching, or when the total number of interrupted beams increases due to a different obstruction.



Reduced Resolution Blanking

### Reduced Resolution Blanking

When the resolution of the MS/MSF4800A is reduced, the size of the smallest detectable object is increased. The output will not turn OFF regardless of how many continuous interrupted beams there are in the sensing area as long as the beams are fewer than the set number (1, 2, or 3 beams).
When an object whose size exceeds the set number of beams intrudes, the output is turned OFF. For example, in an application where a conveyor cart approaches a robot work area, the Safety Light Curtain can be set so that it does not detect only the wheels of the cart, allowing the MS/MSF4800A to be used as a presence sensing device.

## Muting Functions for Temporarily Disabling the Safety Light Curtain

**(MSF4800A only)**

In applications where it is necessary for an object to regularly pass through the sensing area, for example to supply workpieces to a machine, the output will turn OFF each time the object passes through, thus lowering productivity. The muting function makes it possible to raise productivity in this kind of application by temporarily disabling the Safety Light Curtain.
Select from among four muting modes to match each application with the appropriate number and placement of muting sensors.

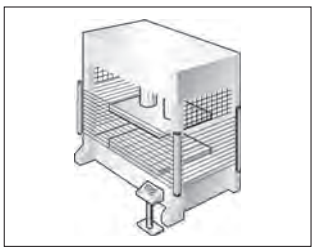


The MS4800-RM6 Resource Module is required when using the muting function.

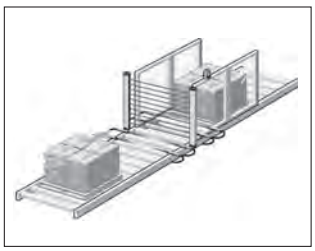
## Complies with the Newest Global Safety Standards

The MS4800-series Safety Light Curtain is a Type 4 safety sensor that can be used to configure a Category 4 safety circuit conforming with IEC 61496-1 and IEC 61496-2 international standards for Safety Light Curtains. It also complies with the IEC 61508 (SIL3) international standard for function safety. These standards ensure safe, reliable use virtually anywhere.

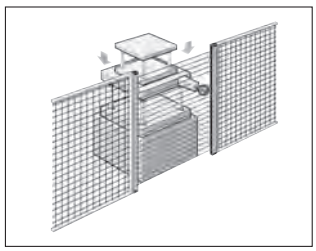
## Applications



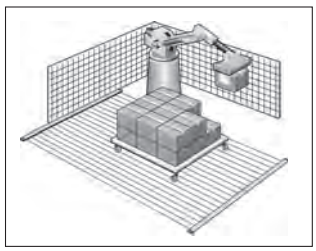
**Three-sided Guard**
The durable housing of the MS4800 Series makes it ideal for applications with strong vibration, like metal processing systems. Its sensing distance of up to 20 m also lets you use mirrors to guard three sides with a single MS4800 system.



**Muting**
(MSF4800A only)
Combining the MSF4800A and the MS4800-RM6 Muting Module lets you set muting without having to use an external controller.



**Floating Blanking**
(Advanced series only)
Floating blanking can be set for one or two beams. When the number of set beams are interrupted, the output is turned OFF.



**Reduced Resolution Blanking**
(Advanced series only)
Reducing the detection resolution of the MS/MSF4800A Safety Light Curtain increases the size of the smallest detectable object. This can improve productivity by allowing objects such as carts to enter the sensing area.

# Ordering Information

## Safety Light Curtains

### MS/MSF4800-series Safety Light Curtains

Infrared light

| Series | Minimum detectable object | Beam gap | Appearance | Sensing distance | Number of beams | Protective height (mm) | Model | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Individual use | Series connection (for muting ✻1) | |
| Advanced Series | 30-mm-dia. | 20 mm |  | 0.3 to 20 m | 14 to 106 | 280 to 2120 | **MS4800A-30-□** | Master | **MSF4800A-30-□** |
| | | | | | | | | Slave ✻2 | **MSF4800-30-□ -XR2** |
| | 40-mm-dia. | 30 mm | | | 12 to 68 | 360 to 2040 | **MS4800A-40-□** | Master | **MSF4800A-40-□** |
| | | | | | | | | Slave ✻2 | **MSF4800-40-□ -XR2** |
| Basic Series | 30-mm-dia. | 20 mm | | | 14 to 106 | 280 to 2120 | **MS4800B-30-□** | Master | **MSF4800B-30-□** |
| | | | | | | | | Slave ✻2 | **MSF4800-30-□ -XR2** |
| | 40-mm-dia. | 30 mm | | | 12 to 68 | 360 to 2040 | **MS4800B-40-□** | Master | **MSF4800B-40-□** |
| | | | | | | | | Slave ✻2 | **MSF4800-40-□ -XR2** |

**Note:** A 4-digit number indicating the protective height of the Light Curtain must be included in place of the box (□) in the model number.
**✻1.** There is no muting function in Basic-series Safety Light Curtains.
**✻2.** The same Slave Light Curtains are used for both the Advanced Series and Basic Series. These Slaves cannot be used individually.

### Functional Comparison of Advanced Series and Basic Series

| Function \ Series / Model | Advanced Series MS/MSF4800A | Basic Series MS/MSF4800B |
|---|---|---|
| **Scan code for mutual interference reduction** | Supported. ✻1 | Supported. ✻1 |
| **External device monitoring (EDM)** | Supported. ✻2 | Supported. ✻2 |
| **Operation mode** | Supported. ✻1 | Supported. ✻1 |
| **Machine test signal (MTS)** | Supported. ✻1 | Supported. ✻1 |
| **Auxiliary output (PNP transistor × 1, or NPN transistor × 1)** | Supported. ✻1 | Supported. (PNP/control output synchronizing only) |
| **Muting via the MS4800-RM6 Resource Module** | Supported. ✻1 (MSF4800A only) | |
| **Floating blanking** | Supported. ✻1 | |
| **Fixed blanking** | Supported. ✻1 | |
| **Monitored blanking** | Supported. ✻1 | |
| **Reduced resolution blanking** | Supported. ✻1 | |
| **Sensing distance setting** | Supported. ✻1 | Supported. ✻1 |
| **Start input method** | Supported. ✻1 | |
| **Response time adjustment** | Supported. ✻1 | |

**✻1.** This function can be set by using the Programming and Diagnostics Module (PDM).
**✻2.** This function can be set by using the PDM or a wiring connection.

## Safety Light Curtain Model List

### Advanced-series Curtains Used Individually (Minimum detectable object: 30-mm dia., Beam gap: 20 mm)

| Model | Number of beams | Protective height (mm) |
|---|---|---|
| MS4800A-30-0280 | 14 | 280 |
| MS4800A-30-0320 | 16 | 320 |
| MS4800A-30-0360 | 18 | 360 |
| MS4800A-30-0400 | 20 | 400 |
| MS4800A-30-0440 | 22 | 440 |
| MS4800A-30-0480 | 24 | 480 |
| MS4800A-30-0520 | 26 | 520 |
| MS4800A-30-0560 | 28 | 560 |
| MS4800A-30-0600 | 30 | 600 |
| MS4800A-30-0640 | 32 | 640 |
| MS4800A-30-0680 | 34 | 680 |
| MS4800A-30-0720 | 36 | 720 |
| MS4800A-30-0760 | 38 | 760 |
| MS4800A-30-0800 | 40 | 800 |
| MS4800A-30-0840 | 42 | 840 |
| MS4800A-30-0880 | 44 | 880 |
| MS4800A-30-0920 | 46 | 920 |
| MS4800A-30-0960 | 48 | 960 |
| MS4800A-30-1000 | 50 | 1000 |
| MS4800A-30-1040 | 52 | 1040 |
| MS4800A-30-1080 | 54 | 1080 |
| MS4800A-30-1120 | 56 | 1120 |
| MS4800A-30-1160 | 58 | 1160 |
| MS4800A-30-1200 | 60 | 1200 |
| MS4800A-30-1240 | 62 | 1240 |
| MS4800A-30-1280 | 64 | 1280 |
| MS4800A-30-1320 | 66 | 1320 |
| MS4800A-30-1360 | 68 | 1360 |
| MS4800A-30-1400 | 70 | 1400 |
| MS4800A-30-1440 | 72 | 1440 |
| MS4800A-30-1480 | 74 | 1480 |
| MS4800A-30-1520 | 76 | 1520 |
| MS4800A-30-1560 | 78 | 1560 |
| MS4800A-30-1600 | 80 | 1600 |
| MS4800A-30-1640 | 82 | 1640 |
| MS4800A-30-1680 | 84 | 1680 |
| MS4800A-30-1720 | 86 | 1720 |
| MS4800A-30-1760 | 88 | 1760 |
| MS4800A-30-1800 | 90 | 1800 |
| MS4800A-30-1840 | 92 | 1840 |
| MS4800A-30-1880 | 94 | 1880 |
| MS4800A-30-1920 | 96 | 1920 |
| MS4800A-30-1960 | 98 | 1960 |
| MS4800A-30-2000 | 100 | 2000 |
| MS4800A-30-2040 | 102 | 2040 |
| MS4800A-30-2080 | 104 | 2080 |
| MS4800A-30-2120 | 106 | 2120 |

### Basic-series Curtains Used Individually (Minimum detectable object: 30-mm dia., Beam gap: 20 mm)

| Model | Number of beams | Protective height (mm) |
|---|---|---|
| MS4800B-30-0280 | 14 | 280 |
| MS4800B-30-0320 | 16 | 320 |
| MS4800B-30-0360 | 18 | 360 |
| MS4800B-30-0400 | 20 | 400 |
| MS4800B-30-0440 | 22 | 440 |
| MS4800B-30-0480 | 24 | 480 |
| MS4800B-30-0520 | 26 | 520 |
| MS4800B-30-0560 | 28 | 560 |
| MS4800B-30-0600 | 30 | 600 |
| MS4800B-30-0640 | 32 | 640 |
| MS4800B-30-0680 | 34 | 680 |
| MS4800B-30-0720 | 36 | 720 |
| MS4800B-30-0760 | 38 | 760 |
| MS4800B-30-0800 | 40 | 800 |
| MS4800B-30-0840 | 42 | 840 |
| MS4800B-30-0880 | 44 | 880 |
| MS4800B-30-0920 | 46 | 920 |
| MS4800B-30-0960 | 48 | 960 |
| MS4800B-30-1000 | 50 | 1000 |
| MS4800B-30-1040 | 52 | 1040 |
| MS4800B-30-1080 | 54 | 1080 |
| MS4800B-30-1120 | 56 | 1120 |
| MS4800B-30-1160 | 58 | 1160 |
| MS4800B-30-1200 | 60 | 1200 |
| MS4800B-30-1240 | 62 | 1240 |
| MS4800B-30-1280 | 64 | 1280 |
| MS4800B-30-1320 | 66 | 1320 |
| MS4800B-30-1360 | 68 | 1360 |
| MS4800B-30-1400 | 70 | 1400 |
| MS4800B-30-1440 | 72 | 1440 |
| MS4800B-30-1480 | 74 | 1480 |
| MS4800B-30-1520 | 76 | 1520 |
| MS4800B-30-1560 | 78 | 1560 |
| MS4800B-30-1600 | 80 | 1600 |
| MS4800B-30-1640 | 82 | 1640 |
| MS4800B-30-1680 | 84 | 1680 |
| MS4800B-30-1720 | 86 | 1720 |
| MS4800B-30-1760 | 88 | 1760 |
| MS4800B-30-1800 | 90 | 1800 |
| MS4800B-30-1840 | 92 | 1840 |
| MS4800B-30-1880 | 94 | 1880 |
| MS4800B-30-1920 | 96 | 1920 |
| MS4800B-30-1960 | 98 | 1960 |
| MS4800B-30-2000 | 100 | 2000 |
| MS4800B-30-2040 | 102 | 2040 |
| MS4800B-30-2080 | 104 | 2080 |
| MS4800B-30-2120 | 106 | 2120 |

### Advanced-series Curtains Used Individually (Minimum detectable object: 40-mm dia., Beam gap: 30 mm)

| Model | Number of beams | Protective height (mm) |
|---|---|---|
| MS4800A-40-0360 | 12 | 360 |
| MS4800A-40-0480 | 16 | 480 |
| MS4800A-40-0600 | 20 | 600 |
| MS4800A-40-0720 | 24 | 720 |
| MS4800A-40-0840 | 28 | 840 |
| MS4800A-40-0960 | 32 | 960 |
| MS4800A-40-1080 | 36 | 1080 |
| MS4800A-40-1200 | 40 | 1200 |
| MS4800A-40-1320 | 44 | 1320 |
| MS4800A-40-1440 | 48 | 1440 |
| MS4800A-40-1560 | 52 | 1560 |
| MS4800A-40-1680 | 56 | 1680 |
| MS4800A-40-1800 | 60 | 1800 |
| MS4800A-40-1920 | 64 | 1920 |
| MS4800A-40-2040 | 68 | 2040 |

### Basic-series Curtains Used Individually (Minimum detectable object: 40-mm dia., Beam gap: 30 mm)

| Model | Number of beams | Protective height (mm) |
|---|---|---|
| MS4800B-40-0360 | 12 | 360 |
| MS4800B-40-0480 | 16 | 480 |
| MS4800B-40-0600 | 20 | 600 |
| MS4800B-40-0720 | 24 | 720 |
| MS4800B-40-0840 | 28 | 840 |
| MS4800B-40-0960 | 32 | 960 |
| MS4800B-40-1080 | 36 | 1080 |
| MS4800B-40-1200 | 40 | 1200 |
| MS4800B-40-1320 | 44 | 1320 |
| MS4800B-40-1440 | 48 | 1440 |
| MS4800B-40-1560 | 52 | 1560 |
| MS4800B-40-1680 | 56 | 1680 |
| MS4800B-40-1800 | 60 | 1800 |
| MS4800B-40-1920 | 64 | 1920 |
| MS4800B-40-2040 | 68 | 2040 |

### Advanced-series Curtains Connected in Series (Minimum detectable object: 30-mm dia., Beam gap: 20 mm)

**Masters**

| Model | Number of beams | Protective height (mm) |
|---|---|---|
| MSF4800A-30-0280 | 14 | 280 |
| MSF4800A-30-0320 | 16 | 320 |
| MSF4800A-30-0360 | 18 | 360 |
| MSF4800A-30-0400 | 20 | 400 |
| MSF4800A-30-0440 | 22 | 440 |
| MSF4800A-30-0480 | 24 | 480 |
| MSF4800A-30-0520 | 26 | 520 |
| MSF4800A-30-0560 | 28 | 560 |
| MSF4800A-30-0600 | 30 | 600 |
| MSF4800A-30-0640 | 32 | 640 |
| MSF4800A-30-0680 | 34 | 680 |
| MSF4800A-30-0720 | 36 | 720 |
| MSF4800A-30-0760 | 38 | 760 |
| MSF4800A-30-0800 | 40 | 800 |
| MSF4800A-30-0840 | 42 | 840 |
| MSF4800A-30-0880 | 44 | 880 |
| MSF4800A-30-0920 | 46 | 920 |
| MSF4800A-30-0960 | 48 | 960 |
| MSF4800A-30-1000 | 50 | 1000 |
| MSF4800A-30-1040 | 52 | 1040 |
| MSF4800A-30-1080 | 54 | 1080 |
| MSF4800A-30-1120 | 56 | 1120 |
| MSF4800A-30-1160 | 58 | 1160 |
| MSF4800A-30-1200 | 60 | 1200 |
| MSF4800A-30-1240 | 62 | 1240 |
| MSF4800A-30-1280 | 64 | 1280 |
| MSF4800A-30-1320 | 66 | 1320 |
| MSF4800A-30-1360 | 68 | 1360 |
| MSF4800A-30-1400 | 70 | 1400 |
| MSF4800A-30-1440 | 72 | 1440 |
| MSF4800A-30-1480 | 74 | 1480 |
| MSF4800A-30-1520 | 76 | 1520 |
| MSF4800A-30-1560 | 78 | 1560 |
| MSF4800A-30-1600 | 80 | 1600 |
| MSF4800A-30-1640 | 82 | 1640 |
| MSF4800A-30-1680 | 84 | 1680 |
| MSF4800A-30-1720 | 86 | 1720 |
| MSF4800A-30-1760 | 88 | 1760 |
| MSF4800A-30-1800 | 90 | 1800 |
| MSF4800A-30-1840 | 92 | 1840 |
| MSF4800A-30-1880 | 94 | 1880 |
| MSF4800A-30-1920 | 96 | 1920 |
| MSF4800A-30-1960 | 98 | 1960 |
| MSF4800A-30-2000 | 100 | 2000 |
| MSF4800A-30-2040 | 102 | 2040 |
| MSF4800A-30-2080 | 104 | 2080 |
| MSF4800A-30-2120 | 106 | 2120 |

### Basic-series Curtains Connected in Series (Minimum detectable object: 30-mm dia., Beam gap: 20 mm)

**Masters**

| Model | Number of beams | Protective height (mm) |
|---|---|---|
| MSF4800B-30-0280 | 14 | 280 |
| MSF4800B-30-0320 | 16 | 320 |
| MSF4800B-30-0360 | 18 | 360 |
| MSF4800B-30-0400 | 20 | 400 |
| MSF4800B-30-0440 | 22 | 440 |
| MSF4800B-30-0480 | 24 | 480 |
| MSF4800B-30-0520 | 26 | 520 |
| MSF4800B-30-0560 | 28 | 560 |
| MSF4800B-30-0600 | 30 | 600 |
| MSF4800B-30-0640 | 32 | 640 |
| MSF4800B-30-0680 | 34 | 680 |
| MSF4800B-30-0720 | 36 | 720 |
| MSF4800B-30-0760 | 38 | 760 |
| MSF4800B-30-0800 | 40 | 800 |
| MSF4800B-30-0840 | 42 | 840 |
| MSF4800B-30-0880 | 44 | 880 |
| MSF4800B-30-0920 | 46 | 920 |
| MSF4800B-30-0960 | 48 | 960 |
| MSF4800B-30-1000 | 50 | 1000 |
| MSF4800B-30-1040 | 52 | 1040 |
| MSF4800B-30-1080 | 54 | 1080 |
| MSF4800B-30-1120 | 56 | 1120 |
| MSF4800B-30-1160 | 58 | 1160 |
| MSF4800B-30-1200 | 60 | 1200 |
| MSF4800B-30-1240 | 62 | 1240 |
| MSF4800B-30-1280 | 64 | 1280 |
| MSF4800B-30-1320 | 66 | 1320 |
| MSF4800B-30-1360 | 68 | 1360 |
| MSF4800B-30-1400 | 70 | 1400 |
| MSF4800B-30-1440 | 72 | 1440 |
| MSF4800B-30-1480 | 74 | 1480 |
| MSF4800B-30-1520 | 76 | 1520 |
| MSF4800B-30-1560 | 78 | 1560 |
| MSF4800B-30-1600 | 80 | 1600 |
| MSF4800B-30-1640 | 82 | 1640 |
| MSF4800B-30-1680 | 84 | 1680 |
| MSF4800B-30-1720 | 86 | 1720 |
| MSF4800B-30-1760 | 88 | 1760 |
| MSF4800B-30-1800 | 90 | 1800 |
| MSF4800B-30-1840 | 92 | 1840 |
| MSF4800B-30-1880 | 94 | 1880 |
| MSF4800B-30-1920 | 96 | 1920 |
| MSF4800B-30-1960 | 98 | 1960 |
| MSF4800B-30-2000 | 100 | 2000 |
| MSF4800B-30-2040 | 102 | 2040 |
| MSF4800B-30-2080 | 104 | 2080 |
| MSF4800B-30-2120 | 106 | 2120 |

### Advanced-series Curtains Connected in Series (Minimum detectable object: 40-mm dia., Beam gap: 30 mm)

**Masters**

| Model | Number of beams | Protective height (mm) |
|---|---|---|
| MSF4800A-40-0360 | 12 | 360 |
| MSF4800A-40-0480 | 16 | 480 |
| MSF4800A-40-0600 | 20 | 600 |
| MSF4800A-40-0720 | 24 | 720 |
| MSF4800A-40-0840 | 28 | 840 |
| MSF4800A-40-0960 | 32 | 960 |
| MSF4800A-40-1080 | 36 | 1080 |
| MSF4800A-40-1200 | 40 | 1200 |
| MSF4800A-40-1320 | 44 | 1320 |
| MSF4800A-40-1440 | 48 | 1440 |
| MSF4800A-40-1560 | 52 | 1560 |
| MSF4800A-40-1680 | 56 | 1680 |
| MSF4800A-40-1800 | 60 | 1800 |
| MSF4800A-40-1920 | 64 | 1920 |
| MSF4800A-40-2040 | 68 | 2040 |

### Basic-series Curtains Connected in Series (Minimum detectable object: 40-mm dia., Beam gap: 30 mm)

**Masters**

| Model | Number of beams | Protective height (mm) |
|---|---|---|
| MSF4800B-40-0360 | 12 | 360 |
| MSF4800B-40-0480 | 16 | 480 |
| MSF4800B-40-0600 | 20 | 600 |
| MSF4800B-40-0720 | 24 | 720 |
| MSF4800B-40-0840 | 28 | 840 |
| MSF4800B-40-0960 | 32 | 960 |
| MSF4800B-40-1080 | 36 | 1080 |
| MSF4800B-40-1200 | 40 | 1200 |
| MSF4800B-40-1320 | 44 | 1320 |
| MSF4800B-40-1440 | 48 | 1440 |
| MSF4800B-40-1560 | 52 | 1560 |
| MSF4800B-40-1680 | 56 | 1680 |
| MSF4800B-40-1800 | 60 | 1800 |
| MSF4800B-40-1920 | 64 | 1920 |
| MSF4800B-40-2040 | 68 | 2040 |

### Advanced Series/Basic-series Curtains Connected in Series (Minimum detectable object: 30-mm dia., Beam gap: 20 mm)

**Slaves**

| Model | Number of beams | Protective height (mm) |
|---|---|---|
| MSF4800-30-0280-XR2 | 14 | 280 |
| MSF4800-30-0320-XR2 | 16 | 320 |
| MSF4800-30-0360-XR2 | 18 | 360 |
| MSF4800-30-0400-XR2 | 20 | 400 |
| MSF4800-30-0440-XR2 | 22 | 440 |
| MSF4800-30-0480-XR2 | 24 | 480 |
| MSF4800-30-0520-XR2 | 26 | 520 |
| MSF4800-30-0560-XR2 | 28 | 560 |
| MSF4800-30-0600-XR2 | 30 | 600 |
| MSF4800-30-0640-XR2 | 32 | 640 |
| MSF4800-30-0680-XR2 | 34 | 680 |
| MSF4800-30-0720-XR2 | 36 | 720 |
| MSF4800-30-0760-XR2 | 38 | 760 |
| MSF4800-30-0800-XR2 | 40 | 800 |
| MSF4800-30-0840-XR2 | 42 | 840 |
| MSF4800-30-0880-XR2 | 44 | 880 |
| MSF4800-30-0920-XR2 | 46 | 920 |
| MSF4800-30-0960-XR2 | 48 | 960 |
| MSF4800-30-1000-XR2 | 50 | 1000 |
| MSF4800-30-1040-XR2 | 52 | 1040 |
| MSF4800-30-1080-XR2 | 54 | 1080 |
| MSF4800-30-1120-XR2 | 56 | 1120 |
| MSF4800-30-1160-XR2 | 58 | 1160 |
| MSF4800-30-1200-XR2 | 60 | 1200 |
| MSF4800-30-1240-XR2 | 62 | 1240 |
| MSF4800-30-1280-XR2 | 64 | 1280 |
| MSF4800-30-1320-XR2 | 66 | 1320 |
| MSF4800-30-1360-XR2 | 68 | 1360 |
| MSF4800-30-1400-XR2 | 70 | 1400 |
| MSF4800-30-1440-XR2 | 72 | 1440 |
| MSF4800-30-1480-XR2 | 74 | 1480 |
| MSF4800-30-1520-XR2 | 76 | 1520 |
| MSF4800-30-1560-XR2 | 78 | 1560 |
| MSF4800-30-1600-XR2 | 80 | 1600 |
| MSF4800-30-1640-XR2 | 82 | 1640 |
| MSF4800-30-1680-XR2 | 84 | 1680 |
| MSF4800-30-1720-XR2 | 86 | 1720 |
| MSF4800-30-1760-XR2 | 88 | 1760 |
| MSF4800-30-1800-XR2 | 90 | 1800 |
| MSF4800-30-1840-XR2 | 92 | 1840 |
| MSF4800-30-1880-XR2 | 94 | 1880 |
| MSF4800-30-1920-XR2 | 96 | 1920 |
| MSF4800-30-1960-XR2 | 98 | 1960 |
| MSF4800-30-2000-XR2 | 100 | 2000 |
| MSF4800-30-2040-XR2 | 102 | 2040 |
| MSF4800-30-2080-XR2 | 104 | 2080 |
| MSF4800-30-2120-XR2 | 106 | 2120 |

### Advanced Series/Basic-series Curtains Connected in Series (Minimum detectable object: 40-mm dia., Beam gap: 30 mm)

**Slaves**

| Model | Number of beams | Protective height (mm) |
|---|---|---|
| MSF4800-40-0360-XR2 | 12 | 360 |
| MSF4800-40-0480-XR2 | 16 | 480 |
| MSF4800-40-0600-XR2 | 20 | 600 |
| MSF4800-40-0720-XR2 | 24 | 720 |
| MSF4800-40-0840-XR2 | 28 | 840 |
| MSF4800-40-0960-XR2 | 32 | 960 |
| MSF4800-40-1080-XR2 | 36 | 1080 |
| MSF4800-40-1200-XR2 | 40 | 1200 |
| MSF4800-40-1320-XR2 | 44 | 1320 |
| MSF4800-40-1440-XR2 | 48 | 1440 |
| MSF4800-40-1560-XR2 | 52 | 1560 |
| MSF4800-40-1680-XR2 | 56 | 1680 |
| MSF4800-40-1800-XR2 | 60 | 1800 |
| MSF4800-40-1920-XR2 | 64 | 1920 |
| MSF4800-40-2040-XR2 | 68 | 2040 |

## Accessories (Sold Separately)

### Connector Cables with a Connector on One End

| Type | Appearance | Specifications | Cable length | Model | Application |
|---|---|---|---|---|---|
| Transmitter Cables |  | M12 connector (5-pin) | 10 m | **MS4800-CBLTX-10M** | For wiring safety circuits containing individual relays with forcibly guided contacts, safety relay units, safety controllers, etc. |
| | | | 15 m | **MS4800-CBLTX-15M** | |
| | | | 30 m | **MS4800-CBLTX-30M** | |
| Receiver Cables |  | M12 connector (8-pin) | 10 m | **MS4800-CBLRX-10M** | |
| | | | 15 m | **MS4800-CBLRX-15M** | |
| | | | 30 m | **MS4800-CBLRX-30M** | |

### Connector Cables with Connectors on Both Ends

| Type | Appearance | Specifications | Cable length | Model | Application |
|---|---|---|---|---|---|
| Transmitter Cables |  | M12 connector (5-pin) | 5 m | **MS4800-CBLTXT-05M** | Extension cables for connector cables with a connector on one end. |
| | | | 10 m | **MS4800-CBLTXT-10M** | |
| | | | 15 m | **MS4800-CBLTXT-15M** | |
| | | | 25 m | **MS4800-CBLTXT-25M** | |
| Receiver Cables |  | M12 connector (8-pin) | 5 m | **MS4800-CBLRXT-05M** | |
| | | | 10 m | **MS4800-CBLRXT-10M** | |
| | | | 15 m | **MS4800-CBLRXT-15M** | |
| | | | 25 m | **MS4800-CBLRXT-25M** | |

### Series Connection Cables

| Type | Appearance | Specifications | Cable length | Model | Application |
|---|---|---|---|---|---|
| Transmitter Cables |  | M12 connector (4-pin) | 0.3 m | **MS4800-CBLTXIC-003M** | For series connection. |
| | | | 0.5 m | **MS4800-CBLTXIC-005M** | |
| | | | 1 m | **MS4800-CBLTXIC-01M** | |
| | | | 2 m | **MS4800-CBLTXIC-02M** | |
| | | | 3 m | **MS4800-CBLTXIC-03M** | |
| | | | 5 m | **MS4800-CBLTXIC-05M** | |
| | | | 10 m | **MS4800-CBLTXIC-10M** | |
| Receiver Cables |  | M12 connector (4-pin) | 0.3 m | **MS4800-CBLRXIC-003M** | |
| | | | 0.5 m | **MS4800-CBLRXIC-005M** | |
| | | | 1 m | **MS4800-CBLRXIC-01M** | |
| | | | 2 m | **MS4800-CBLRXIC-02M** | |
| | | | 3 m | **MS4800-CBLRXIC-03M** | |
| | | | 5 m | **MS4800-CBLRXIC-05M** | |
| | | | 10 m | **MS4800-CBLRXIC-10M** | |

### Adaptor Cables for Replacement Use

| Type | Appearance | Specifications | Cable length | Model | Application |
|---|---|---|---|---|---|
| Transmitter Cables |  | M12 connector (8-pin) | 0.22 m | **MS4800-ADPT-TXM** | For replacing an MS4600 (with test input) with an MS4800. |
| | | M12 connector (5-pin) | 0.22 m | **MS4800-ADPT-TXS** | For replacing an F3SL or MS4600 (without test input) with an MS4800. |
| Receiver Cables |  | M12 connector (8-pin) | 0.22 m | **MS4800-ADPT-RX** | For replacing an F3SL or MS4600 with an MS4800. |

### Loose-wire Connectors for Relays

| Type | Appearance | Specifications | Cable length | Model | Application |
|---|---|---|---|---|---|
| Transmitter Cables |  | M12 connector (5-pin) | 1 m | **MS4800-PMCTX-01M** | Loose-wire connectors for mounting in relay boxes. |
| | | | 5 m | **MS4800-PMCTX-05M** | |
| Receiver Cables |  | M12 connector (8-pin) | 1 m | **MS4800-PMCRX-01M** | |
| | | | 5 m | **MS4800-PMCRX-05M** | |

### Programming and Diagnostics Module (PDM)

| Appearance | Model | Remarks |
|---|---|---|
|  | **MS4800-PDM** | Cable length: 2 m |

### Mirrors (12% Sensing Distance Attenuation)

| Appearance | Mirror material | Width (mm) | Thickness (mm) | Length (mm) | Model |
|---|---|---|---|---|---|
|  | Glass mirror | 145 | 32 | 406 | **F39-MLG0406** |
| | | | | 610 | **F39-MLG0610** |
| | | | | 711 | **F39-MLG0711** |
| | | | | 914 | **F39-MLG0914** |
| | | | | 1,067 | **F39-MLG1067** |
| | | | | 1,219 | **F39-MLG1219** |
| | | | | 1,422 | **F39-MLG1422** |
| | | | | 1,626 | **F39-MLG1626** |
| | | | | 1,830 | **F39-MLG1830** |
| | | | | 2,134 | **F39-MLG2134** |

### MS4800-RM6 Connection Cables

| Appearance | Cable length | Model | Application |
|---|---|---|---|
|  | 10 m | **MS4800-CBLMT-10M** | For connecting an MSF4800A Receiver and an MS4800-RM6 Resource Module. |
| | 15 m | **MS4800-CBLMT-15M** | |
| | 30 m | **MS4800-CBLMT-30M** | |

### Resource Module

| Appearance | Model | Application |
|---|---|---|
|  | **MS4800-RM6** | A special terminal module for using muting. |

### Water-resistant IP67 Cases (for Both Transmitters and Receivers, 2 Cases Per Set) (10% Maximum Sensing Distance Attenuation Per Case)

| Type | Appearance | Model | Remarks |
|---|---|---|---|
| For individual use |  | **MS4800-IP67-□ ✻** | Accessories: Two mounting brackets (one top, one bottom)<br>Material: Acryl |
| For series-connection use | | **MSF4800-IP67-□ ✻** | |

✻ A 4-digit number indicating the protective height of the Light Curtain must be included in place of the box (□) in the model number.

### Spatter Protection Covers (for Both Transmitters and Receivers, 2 Covers Per Set) (10% Maximum Sensing Distance Attenuation Per Cover)

| Type | Appearance | Model | Remarks |
|---|---|---|---|
| MS4800 Cover |  | **MS4800WS-□ ✻** | Material: Acryl |

✻ A 4-digit number indicating the protective height of the Light Curtain must be included in place of the box (□) in the model number.

# Specifications (For details, refer to the *Instruction Manual* or *User's Manual*.)

## Safety Light Curtains

### MS/MSF4800-series Safety Light Curtains

| Item | Series | Advanced Series | | Basic Series | |
|---|---|---|---|---|---|
| Model | Individual use | MS4800A-30-□ | MS4800A-40-□ | MS4800B-30-□ | MS4800B-40-□ |
| | Series connection | MSF4800A-30-□ | MSF4800A-40-□ | MSF4800B-30-□ | MSF4800B-40-□ |
| Sensor type | | Type 4 Safety Light Curtain | | | |
| Setting tool connection | | Connectable | | | |
| Applicable safety category | | Category 4, 3, 2, 1, or B | | | |
| Minimum detectable object | | Opaque object: 30-mm dia. | Opaque object: 40-mm dia. | Opaque object: 30-mm dia. | Opaque object: 40-mm dia. |
| Beam gap (P) | | 20 mm | 30 mm | 20 mm | 30 mm |
| Number of beams (n) | | 14 to 106 | 12 to 68 | 14 to 106 | 12 to 68 |
| Protective height (PH) | | 280 to 2120 mm | 360 to 2040 mm | 280 to 2120 mm | 360 to 2040 mm |
| Sensing distance ✻1 | | 0.3 to 20 m (selectable from 0.3 to 8 m with the Programming and Diagnostics Module) | | | |
| Lens diameter | | Diameter 7 mm | | | |
| Response time (under stable light incident condition) (Refer to page 257 for details.) | ON to OFF | Individual: 14 to 32 ms | Individual: 14 to 23 ms | Individual: 14 to 32 ms | Individual: 14 to 23 ms |
| | OFF to ON | 320 ms max. | | | |
| Startup waiting time | | 3.5 s max. for individual use, 4.5 s max. for series connection | | | |
| Power supply voltage (Vs) | | 24 VDC ±20% (ripple p-p: 5% max.) | | | |
| Current consumption ✻2 (no load) | Transmitter | 285 mA max. | | | |
| | Receiver | 450 mA max. | | | |
| Light source (emitted wavelength) | | Infrared LEDs (wavelength: 880 nm) | | | |
| Effective aperture angle (EAA) | | Within ±2.5° for the Transmitter and Receiver at a sensing distance of at least 3 m according to IEC 61496-2. | | | |
| Control output (OSSD) ✻3 | | Output transistor: PNP × 2, Load current: 625 mA max. (at 24 VDC), short-circuit protection | | | |
| Auxiliary output ✻3 (non-safety output) | | Output transistor:<br>PNP × 1 or NPN × 1, selectable with the Programming and Diagnostics Module, Load current: 100 mA max. (at 24 VDC)<br>Output mode:<br>Control output synchronizing or alarm is selectable with the Programming and Diagnostics Module | | Output transistor:<br>PNP × 1, Load current: 100 mA max. (at 24 VDC)<br>Output mode: Control output synchronizing | |
| Output operation mode | | Control output 1, 2: Light-ON<br>Auxiliary output:<br>Control Output Synchronizing Mode: Auxiliary output goes ON when control output goes ON<br>Alarm Mode: Auxiliary output goes ON when the MS4800 enters alarm (lockout) condition | | | |
| Input voltage | | External device monitoring input ON voltage: 11 to 28.8 V, OFF voltage: 0 to 2.6 V<br>Start input ON voltage: 11 to 28.8 V, OFF voltage: 0 to 1.2 V<br>For the MS4800B, use NC contacts for the start input switch.<br>For the MS4800A, refer to *Start Input Methods (MS/MSF4800A Only)* on page 266. | | | |
| Internal indicators | Transmitter | Transmitter Indicator (Yellow): Indicator is ON when transmitting | | | |
| | Receiver | Blanking Indicator (Orange): Indicator is ON in Blanking Active State<br>Interlock or Alarm (Lockout) Indicator: Indicator is ON in Interlock State, and indicator flashes in Alarm (Lockout) State<br>Machine Run/Stop Indicator (Green/Red): Green indicator is ON when Control Output is ON, and red indicator is ON when Control Output is OFF | | | |
| Mutual interference prevention function | | The scan code (A/B) can be switched with the Programming and Diagnostics Module | | | |
| Series connection | | MSF4800 only<br>• Connectable segments: 4 max.<br>• Total number of beams: 256 max.<br>• Maximum cable length between segments: 10 m<br>• Response time when connected: Refer to page 257. | | | |
| Test functions | | • Self test (when power is turned ON and while power is supplied)<br>• External test (light emission stop function by test input) | | | |

✻1. Use of the Spatter Protection Cover causes a 10% maximum sensing distance attenuation.
✻2. The consumption current must not exceed 1.35 A for both the control outputs and auxiliary output. The rated current is the sum of the Transmitter (285 mA), Receiver (450 mA), control output 1 (625 mA), control output 2 (625 mA), and auxiliary output (100 mA).
✻3. The 24-VDC value is a nominal value. The actual voltage depends on the supply voltage. Actual voltage = Supply voltage − 1 V.

| Item | Series | Advanced Series | | Basic Series | |
|---|---|---|---|---|---|
| Model | Individual use | MS4800A-30-□ | MS4800A-40-□ | MS4800B-30-□ | MS4800B-40-□ |
| | Series connection | MSF4800A-30-□ | MSF4800A-40-□ | MSF4800B-30-□ | MSF4800B-40-□ |
| **Safety functions** | | • Selection of auto start mode and interlock mode<br>• External device monitoring<br>• Muting (MSF4800A only) (MS4800-RM6 (sold separately) is required.)<br>• Fixed blanking<br>• Floating blanking<br>• Monitored blanking<br>• Reduced resolution blanking | | • Selection of auto start mode and interlock mode<br>• External device monitoring | |
| **Connection method** | | Power supply connectors (M12, Transmitter: 5-pin, Receiver: 8-pin)<br>Series-connection connectors: (M12, Transmitter: 4-pin, Receiver: 4-pin) | | | |
| **Protective circuit** | | Output short-circuit protection, reverse polarity protection | | | |
| **Ambient temperature** | | Operating: −10 to 55°C (with no icing), storage: −25 to 70°C | | | |
| **Ambient humidity** | | 95% max. (with no condensation) | | | |
| **Insulation resistance** | | 20 MΩ min. (at 500 VDC) | | | |
| **Dielectric strength** | | Transmitter: 350 VAC 60 Hz 1 min<br>Receiver: 500 VDC 1 min | | | |
| **Degree of protection** | | IP65 (IEC 60529) | | | |
| **Vibration resistance** | | Malfunction: 10 to 55 Hz, 0.35-mm double amplitude, 20 sweeps in X, Y, and Z directions | | | |
| **Shock resistance** | | Malfunction: 10G, 1,000 times in X, Y, and Z directions | | | |
| **Materials** | | Case: Aluminum with polyurethane powder coating<br>Cap: Polycarbonate | | | |
| **Accessories** | | Test rod, Instruction Manual, mounting set (2 top, 2 bottom mounting brackets), surge absorber | | | |
| **Applicable standards** | | IEC 61496-1, EN 61496-1, UL 61496-1 Type 4 ESPE (Electro-Sensitive Protective Equipment), IEC 61496-2, prEN 61496-2, UL 61496-2 Type 4 AOPD (Active Opto-electronic Protective Devices), IEC 61508 SIL3 | | | |

### Response Time

#### Curtains Used Individually (1-segment System)

| Minimum number of beams | Maximum number of beams | Response time (ms) | |
|---|---|---|---|
| | | Normal | Delayed ✻ |
| 0 | 16 | 14 | 23 |
| 17 | 71 | 23 | 38 |
| 72 | 126 | 32 | 53 |
| 127 | 180 | 41 | 68 |
| 181 | 235 | 50 | 83 |
| 236 | 256 | 59 | 99 |

#### Curtains Used in Series Connection (2-segment System)

| Minimum number of beams | Maximum number of beams | Response time (ms) | |
|---|---|---|---|
| | | Normal | Delayed ✻ |
| 0 | 65 | 23 | 38 |
| 66 | 120 | 32 | 53 |
| 121 | 174 | 41 | 68 |
| 175 | 229 | 50 | 83 |
| 230 | 256 | 59 | 99 |

#### Curtains Used in Series Connection (3-segment System)

| Minimum number of beams | Maximum number of beams | Response time (ms) | |
|---|---|---|---|
| | | Normal | Delayed ✻ |
| 0 | 59 | 23 | 38 |
| 60 | 114 | 32 | 53 |
| 115 | 168 | 41 | 68 |
| 169 | 223 | 50 | 83 |
| 224 | 256 | 59 | 99 |

#### Curtains Used in Series Connection (4-segment System)

| Minimum number of beams | Maximum number of beams | Response time (ms) | |
|---|---|---|---|
| | | Normal | Delayed ✻ |
| 0 | 53 | 23 | 38 |
| 54 | 108 | 32 | 53 |
| 109 | 162 | 41 | 68 |
| 163 | 217 | 50 | 83 |
| 218 | 256 | 59 | 99 |

✻ Refer to *Response Time Adjustment (MS/MSF4800A Only)* on page 266.

### Cable Extension Length

The maximum length and wire gauge for input and output signals are given in the following table.

| Type | Signal name | Wire gauge | Rated maximum length |
|---|---|---|---|
| Receiver | Control outputs 1 and 2 | 22 AWG (0.32 mm) | 300-mA load: 45 m, 625-mA load: 22 m |
| | Auxiliary output | 22 AWG (0.32 mm) | 50 m |
| | Start input | 24 AWG (0.20 mm) | 50 m |
| | External device monitoring (EDM) input | 24 AWG (0.20 mm) | 50 m |
| | +24 V, 0 V | 20 AWG (0.52 mm) | 1.8-A load: 12.5 m, 1-A load: 22 m |
| Transmitter | +24 V, 0 V | 22 AWG (0.32 mm) | 0.3-A load: 47 m |
| | Machine test signal (MTS) | 22 AWG (0.32 mm) | 50 m |

**Note:** Keep the cable length within the rated length. Failure to do so is dangerous because it may prevent safety functions from operating normally.

## Accessories

### Resource Module

| Item / Model | MS4800-RM6 |
|---|---|
| Input power supply | 24 VDC ±20%, 30 mA max. |
| Ambient temperature | 0 to 55°C |
| Ambient humidity | 95% max. (with no condensation) |
| Storage temperature | −25 to 75°C |
| Vibration resistance | Malfunction: 10 to 55 Hz, 0.35-mm double amplitude, 20 sweeps in X, Y, and Z directions |
| Shock resistance | Malfunction: 10G, 1,000 times in X, Y, and Z directions |
| Degree of protection | IP20 (IEC 60529) |
| Muting sensor ✻1 | PNP 24-VDC (power consumption: 20 mA) Dark-ON/Light-ON or NO/NC combination |
| Muting indicator output ✻2 | 10 to 100 mA (NPN), 30 VDC max. |
| Applicable safety category | IEC 61496-1 Type 4 |

**✻1.** For details, refer to *Mini Safe 4800 Series Light Curtains Installation and Operating Manual*.
**✻2.** The muting indicator output contains a current monitoring circuit to confirm normal operation. Connect an external indicator load that supplies 10 to 100 mA of current.

### Programming and Diagnostics Module

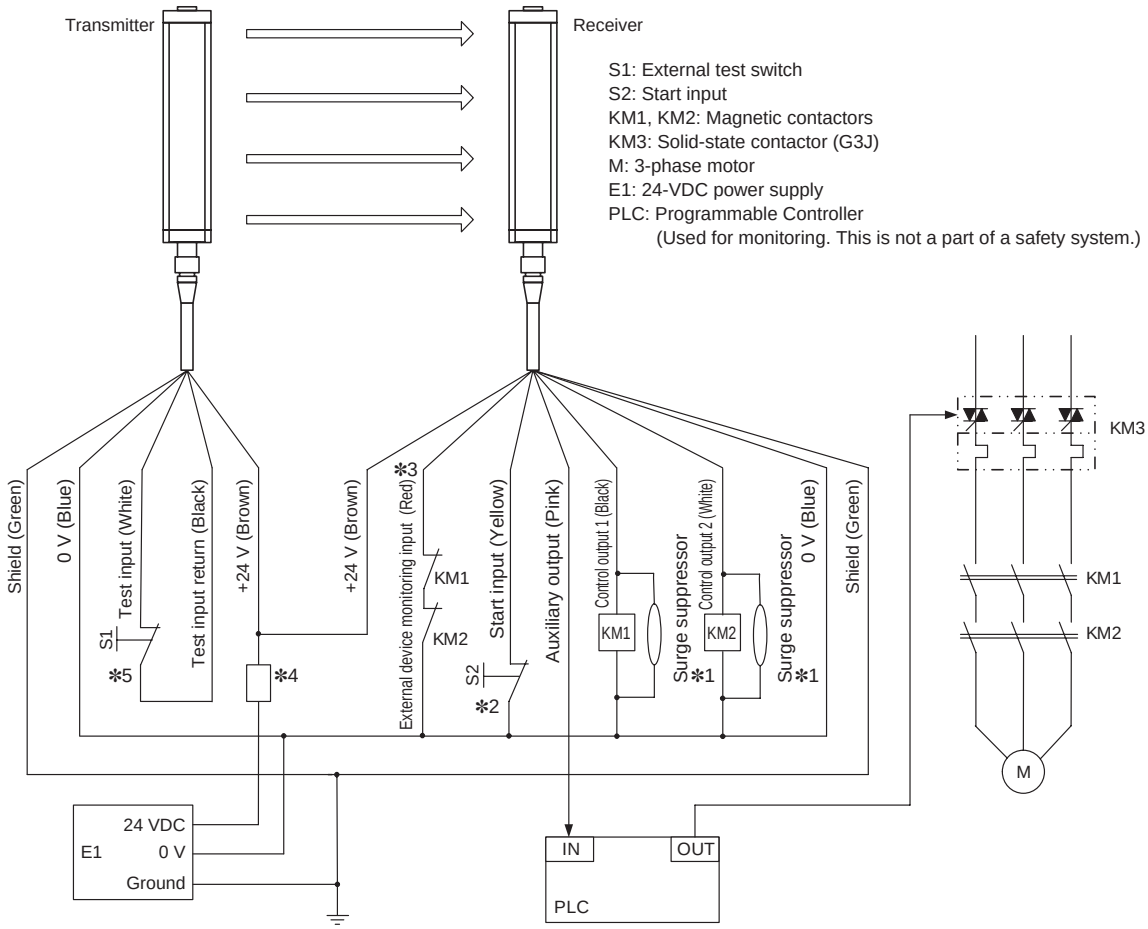
| Item / Model | MS4800-PDM |
|---|---|
| Display | LCD multi-line display |
| Language capability | English, Japanese |
| Degree of protection | Conforms to IP65 |

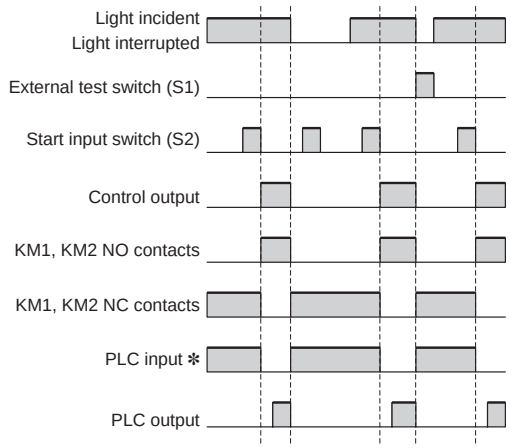
# Connection Circuit Examples

## Examples of Safety Circuits

### Example When Using the MS/MSF4800 Individually (Category 4)

MS/MSF4800 Settings
- Use Start/Restart Interlock Mode. (Use the PDM to set the operation mode to Start/Restart Interlock Mode.)
- Use the external relay monitor function. (Use the PDM to turn ON the EDM function.)
- Use the test input. (Use the PDM to enable the test input.)




✻ The output operation mode of the auxiliary output is the Dark-ON output mode.

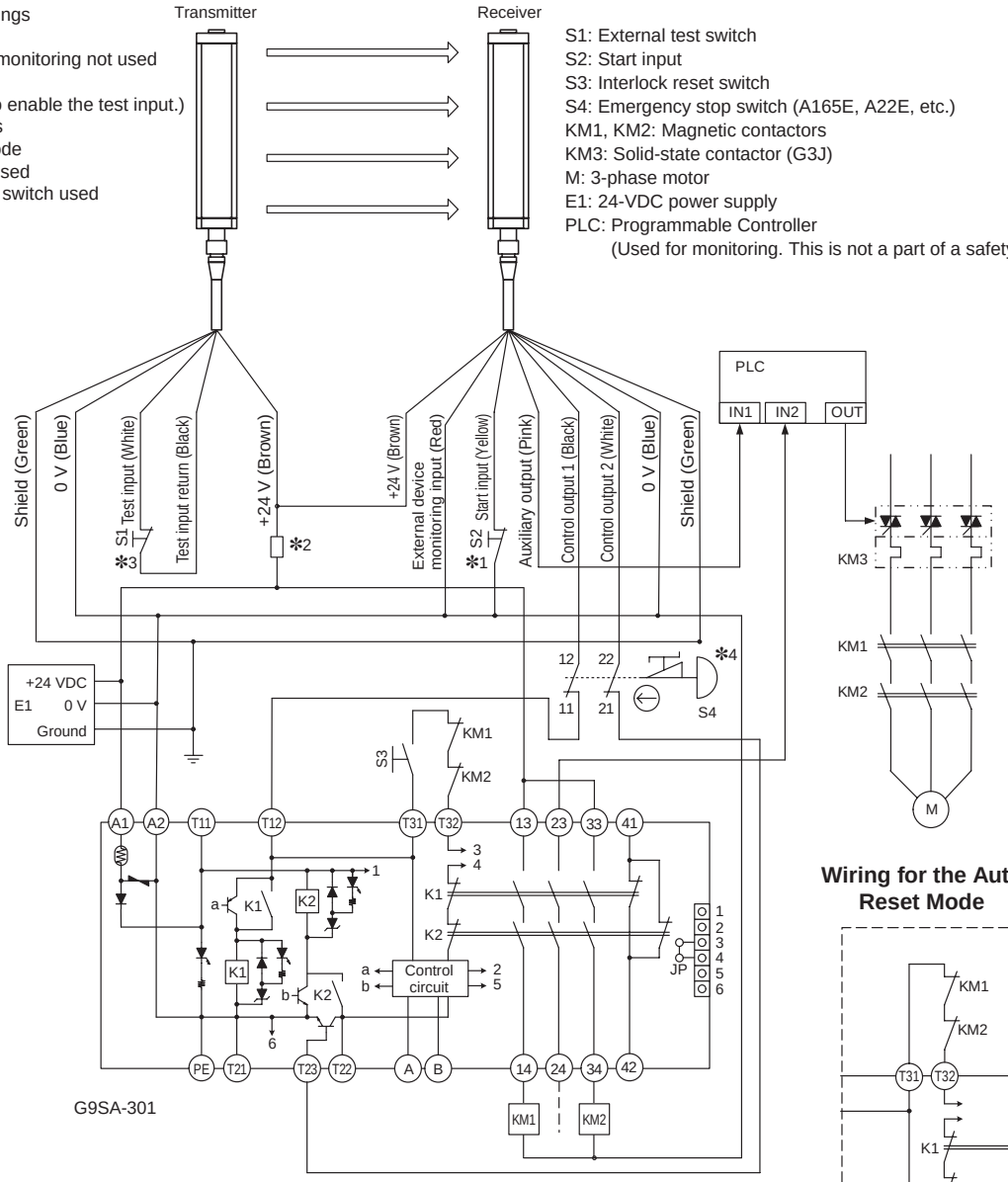
**✻1.** Make sure that both external devices have been suitably suppressed.
**✻2.** For the MS/MSF4800B, use an NC contacts for the start input switch. For the MS/MSF4800A, refer to *Start Input Methods (MS/MSF4800A Only)* on page 266. When using Auto Start Mode, use the PDM to check that the operation mode is set to Auto Start Mode (default), and connect the start input to 0 V.
**✻3.** With the default setting, the external relay monitor input (EDM) is set so that the EDM is enabled and disabled with the start input. This will prevent accessing the normal functionality of the start input. To use both the start input and the EDM as shown in the example safety circuits on this page, connect the PDM to the Receiver and use the PDM to enable the EDM. If the EDM is not necessary, use the PDM to disable the EDM, and then connect the EDM (red wire) to 0 V. For details, refer to *Mini Safe 4800 Series Light Curtains Installation and Operating Manual*.
**✻4.** Fuse (provided by the customer).
**✻5.** The test input is disabled with the default setting. To use the test input, connect the PDM to the Receiver and enable the test input, and use NC contacts for the test input.

## Example When Connected to the G9SA-301 Controller (Category 4)

MS/MSF4800 Settings
- Auto start mode
- External device monitoring not used
- Test input used.
  (Use the PDM to enable the test input.)

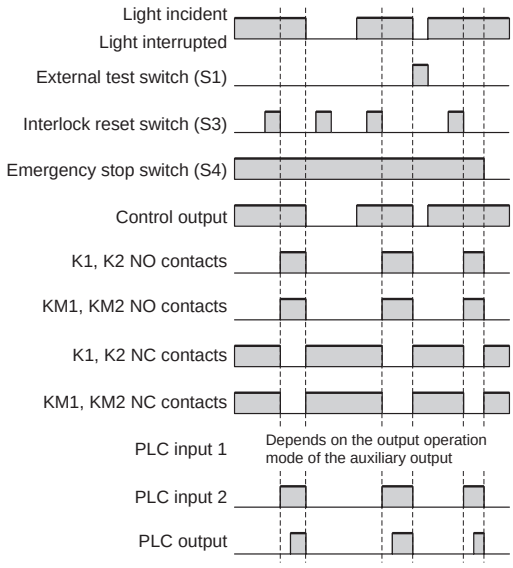
G9SA-301 Settings
- Manual reset mode
- Feedback loop used
- Emergency stop switch used

S1: External test switch
S2: Start input
S3: Interlock reset switch
S4: Emergency stop switch (A165E, A22E, etc.)
KM1, KM2: Magnetic contactors
KM3: Solid-state contactor (G3J)
M: 3-phase motor
E1: 24-VDC power supply
PLC: Programmable Controller
(Used for monitoring. This is not a part of a safety system.)




### Wiring for the Auto Reset Mode



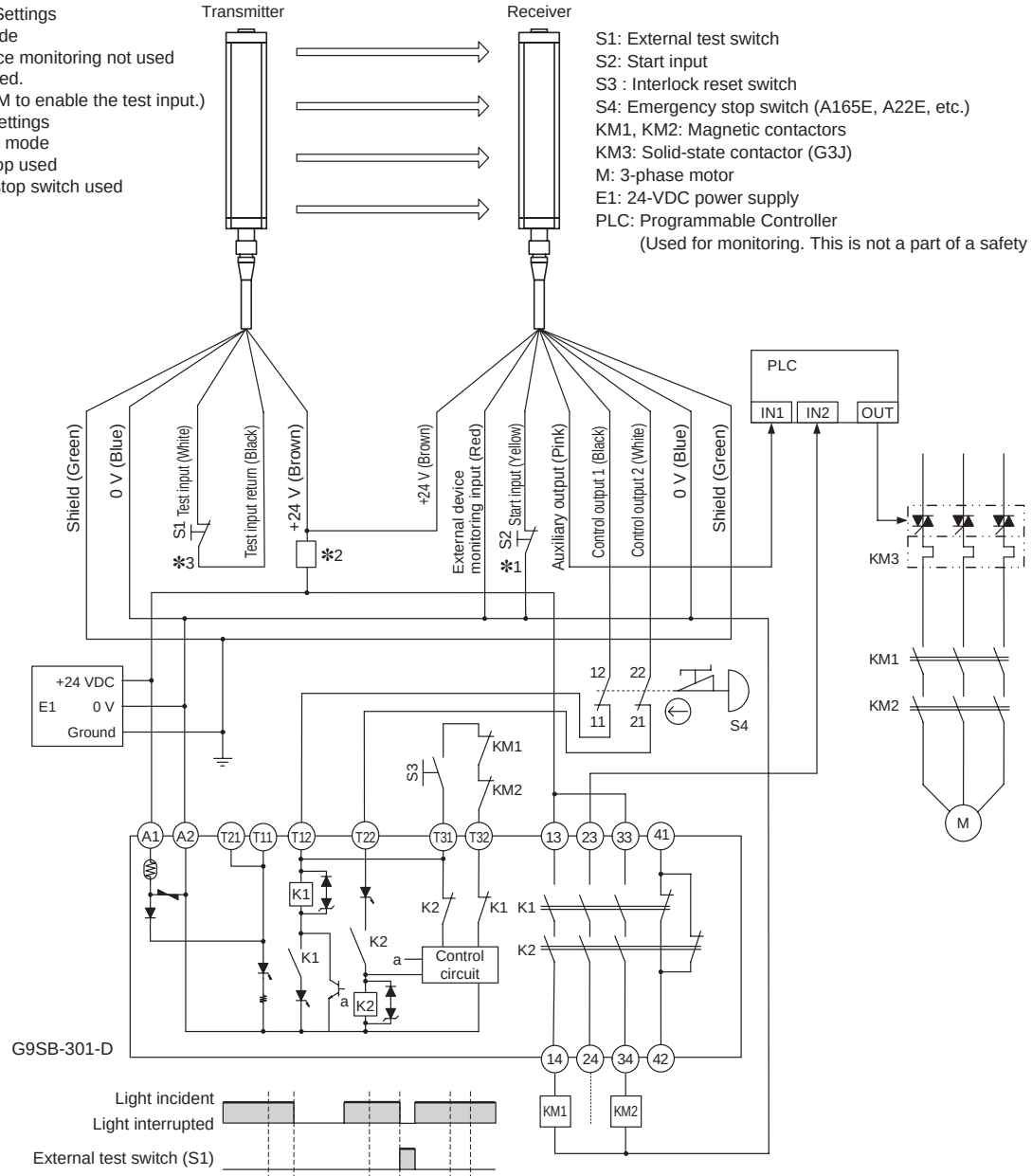




**✻1.** For the MS/MSF4800B, use NC contacts for the start input switch.
For the MS/MSF4800A, refer to *Start Input Methods (MS/MSF4800A Only)* on page 266.
**✻2.** Fuse (provided by the customer).
**✻3.** The test input is disabled with the default setting. To use the test input, connect the PDM to the Receiver and enable the test input, and use NC contacts for the test input.
**✻4.** If an emergency stop switch is not used, connect control output 1 to T12 terminal and control output 2 to T23 terminal directly.

## Example When Connected to the G9SB-301-D Controller (Category 4)

MS/MSF4800 Settings
- Auto start mode
- External device monitoring not used
- Test input used.
  (Use the PDM to enable the test input.)

G9SB-301-D Settings
- Manual reset mode
- Feedback loop used
- Emergency stop switch used

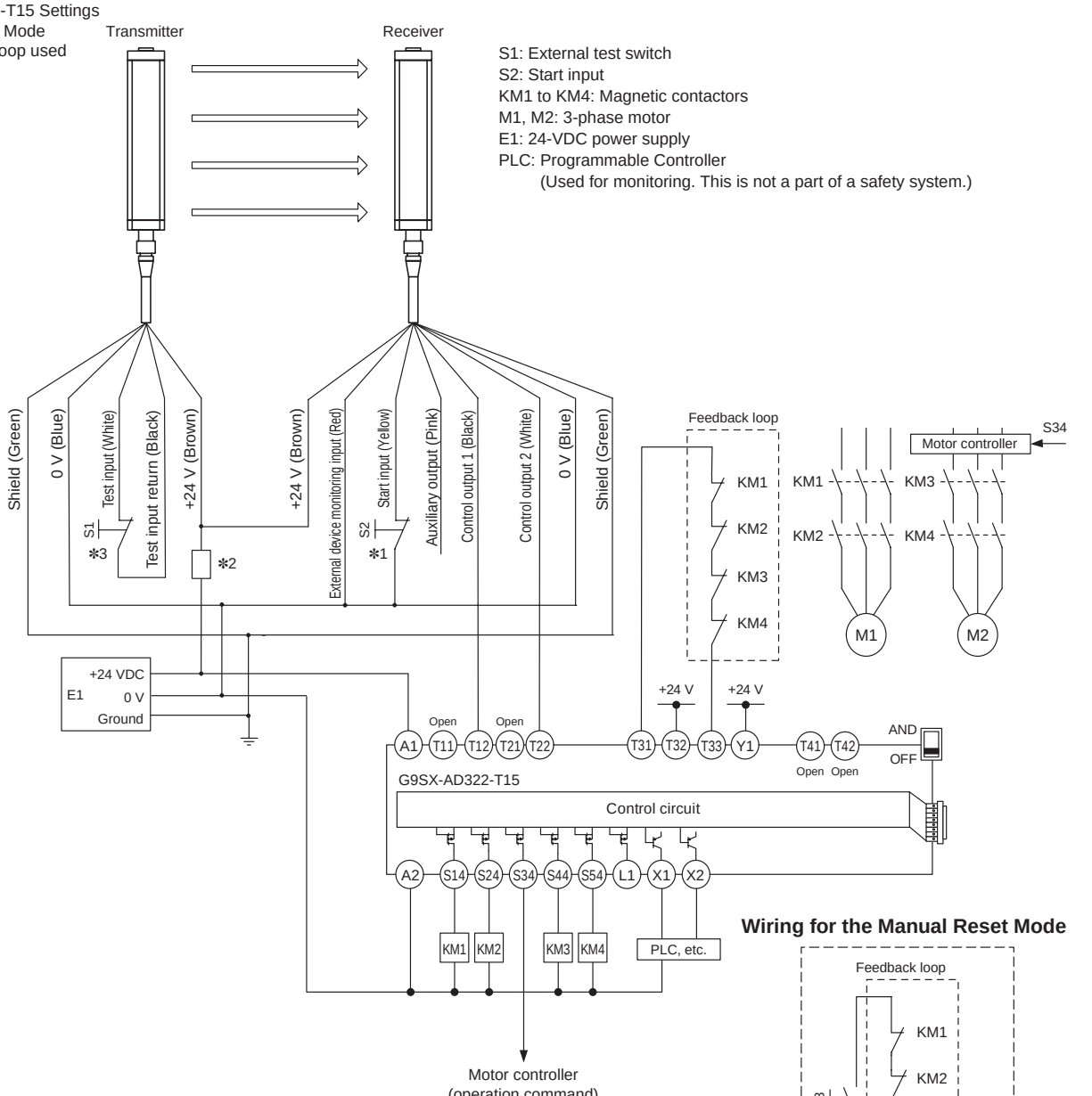



**✻1.** For the MS/MSF4800B, use NC contacts for the start input switch. For the MS/MSF4800A, refer to *Start Input Methods (MS/MSF4800A Only)* on page 266.
**✻2.** Fuse (provided by the customer).
**✻3.** The test input is disabled with the default setting. To use the test input, connect the PDM to the Receiver and enable the test input, and use NC contacts for the test input.

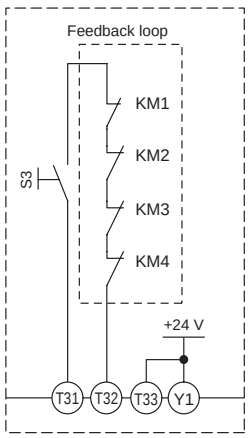
## Example When Connected to the G9SX-AD322-T15 Controller (Category 4)

MS/MSF4800 Settings
- Auto start mode
- External device monitoring not used
- Test input used. (Use the PDM to enable the test input.)

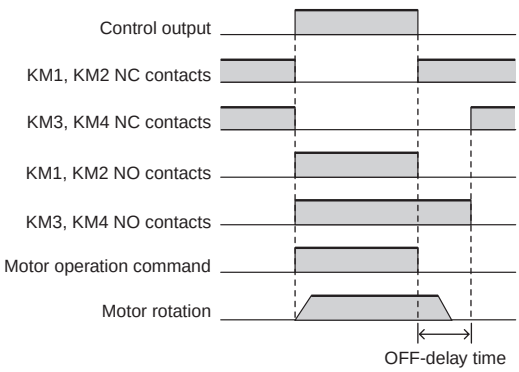
G9SX-AD322-T15 Settings
- Auto Reset Mode
- Feedback loop used




### Wiring for the Manual Reset Mode

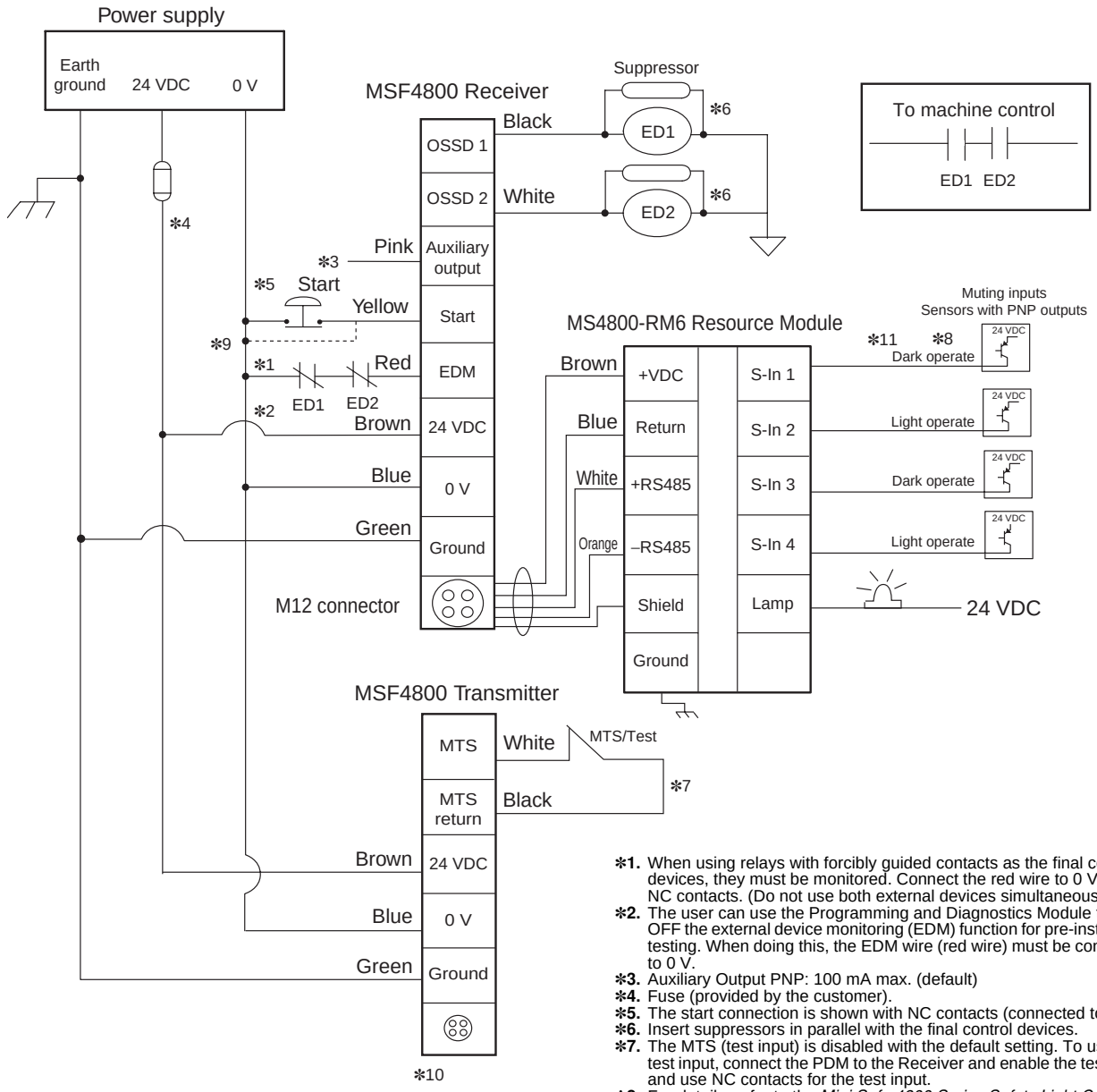



S3: Reset switch



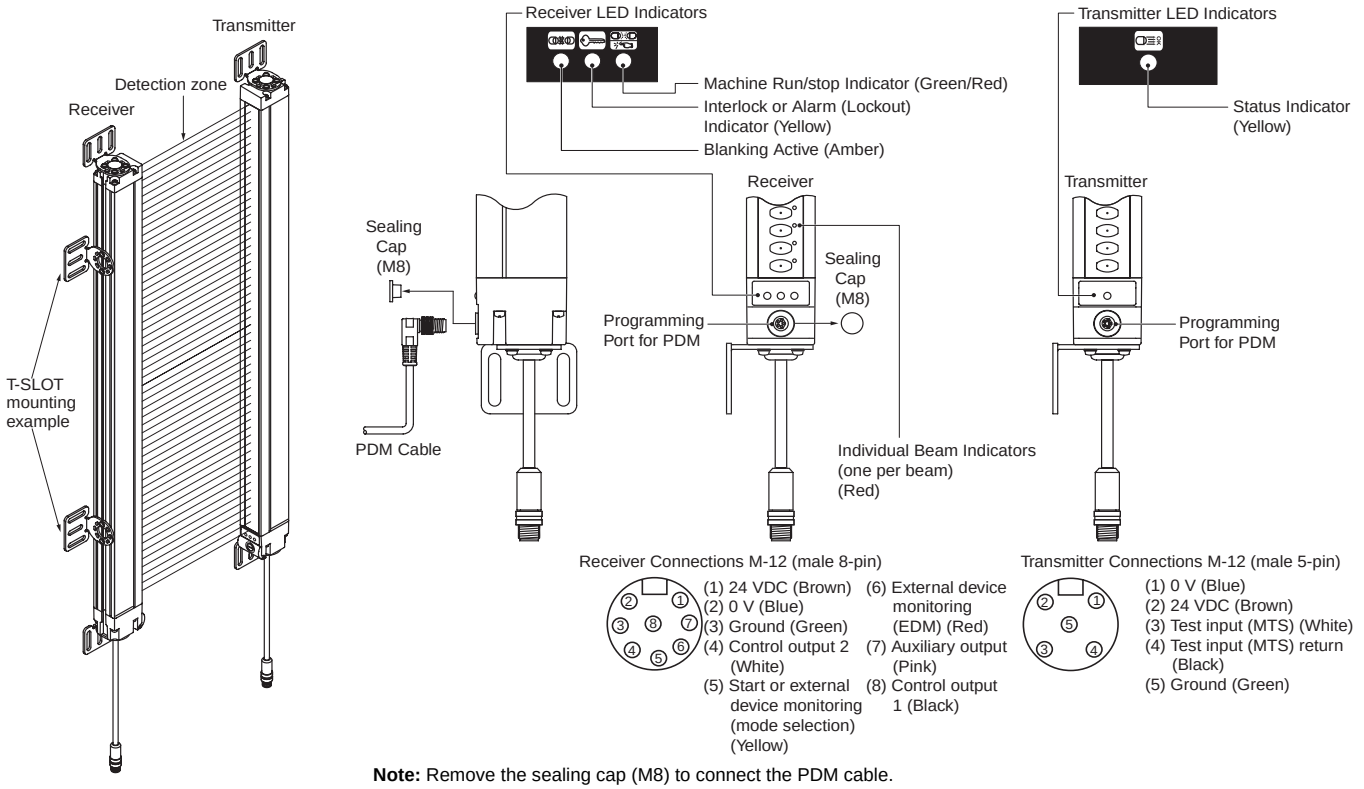

**✻1.** For the MS/MSF4800B, use NC contacts for the start input switch.
For the MS/MSF4800A, refer to *Start Input Methods (MS/MSF4800A Only)* on page 266.
**✻2.** Fuse (provided by the customer).
**✻3.** The test input is disabled with the default setting. To use the test input, connect the PDM to the Receiver and enable the test input, and use NC contacts for the test input.

**Connection to the MS4800-RM6 Resource Module (MSF4800A Only)**




**∗1.** When using relays with forcibly guided contacts as the final control devices, they must be monitored. Connect the red wire to 0 V via the NC contacts. (Do not use both external devices simultaneously.)
**∗2.** The user can use the Programming and Diagnostics Module to turn OFF the external device monitoring (EDM) function for pre-installation testing. When doing this, the EDM wire (red wire) must be connected to 0 V.
**∗3.** Auxiliary Output PNP: 100 mA max. (default)
**∗4.** Fuse (provided by the customer).
**∗5.** The start connection is shown with NC contacts (connected to 0 V).
**∗6.** Insert suppressors in parallel with the final control devices.
**∗7.** The MTS (test input) is disabled with the default setting. To use the test input, connect the PDM to the Receiver and enable the test input, and use NC contacts for the test input.
**∗8.** For details, refer to the *Mini Safe 4800 Series Safety Light Curtains Installation and Operating Manual*.
**∗9.** Connect the yellow wire to 24 VDC to enable external device monitoring (EDM), and to 0 V to disable EDM.
**∗10.** Not used.
**∗11.** There is no need to connect sensor inputs that are not used.

# Nomenclature



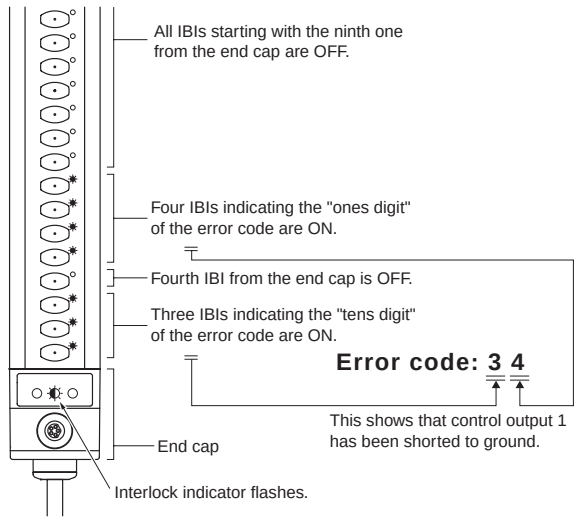

**Note:** Remove the sealing cap (M8) to connect the PDM cable.

### Individual Beam Indicators (IBI)

All MS4800 Safety Light Curtains have an Individual Beam Indicator (IBI) next to each infrared beam on the Receiver. The IBI indicates whether the beam is interrupted or clear. When the beam is interrupted, the IBI goes ON; when it is clear, the IBI goes OFF. If there is less than 10 clear beams, every other IBI will light to indicate that the MS/MSF4800 is not synchronized.

### Example of IBI Indication for an Error (Error Code 34)

Front View of the Receiver




**Note:** For details on error codes, refer to the *Mini Safe 4800 Series Safety Light Curtains Installation and Operating Manual*.

### Receiver LED Indicators

○ OFF ◐ Flashing ● ON

| Operating condition | Condition indication | Description |
|---|---|---|
| Machine Run State | Green | Two Receiver control outputs (safety outputs) are ON, and the green Machine Run indicator is ON. |
| Machine Stop State | Red | Two Receiver control outputs (safety outputs) are OFF, and the red Machine Stop indicator is ON. |
| Interlock State | Yellow Red | Two Receiver control outputs (safety outputs) are OFF, and the red Machine Stop indicator and the yellow Interlock indicator are ON. |
| Alarm (Lock-out) state | Yellow Red | Two Receiver control outputs (safety outputs) are OFF, the red Machine Stop indicator is ON, the yellow Interlock indicator is flashing, and the auxiliary output is OFF. |
| Blanking Active state | Amber | Operating with blanking enabled. |

### Transmitter LED Indicators

◐ Flashing ● ON

| Operating condition | Condition indication | Description |
|---|---|---|
| Transmitting state | Yellow | When the Transmitter receives power and enters the Transmitting state, the indicator turns ON. When the Machine Test Signal (MTS) is enabled, the Transmitter enters the Transmitting Stop state, and the indicator turns OFF. |
| Error state/ PDM Programming state | Yellow | When an error occurs due to the Transmitter, or when the Programming and Diagnostics Module is being used to change a setting, the indicator flashes. |

# Safety Functions

## Operation Modes

### Auto Start

If no objects are detected in the sensing area when the power is turned ON in Auto Start Mode, the system enters the Machine Run State. If an object is then detected, the system changes from the Machine Run State to the Machine Stop State, and remains in that state until the object is removed. When the intrusion into the sensing area disappears, the system automatically changes from the Machine Stop State to the Machine Run State.

### Start Interlock

If no objects are in the sensing area when the power is turned ON in Start Interlock Mode and an alarm (lockout) condition does not occur, the system enters the Interlock State. To shift to the Machine Run State, an operator must press and release the Start Button on the Safety Light Curtain. If an object intrudes in the sensing area during the Machine Run State, the system will change to the Machine Stop State. When the object is removed from the sensing area, the system will automatically shift to the Machine Run State.

### Start/Restart Interlock

If no objects are in the sensing area when the power is turned ON in Start/Restart Interlock Mode and an alarm (lockout) condition does not occur, the system enters the Interlock State. To shift to the Machine Run State, an operator must press and release the Start Button on the Safety Light Curtain. If an object intrudes in the sensing area during the Machine Run State, the system will change to the Machine Stop State. When the object is removed from the sensing area, the system will shift to the Interlock State instead of automatically shifting to the Machine Run State. To shift to the Machine Run State, an operator must press and release the Start Button. When there is an object in the sensing area, the Start Button is disabled.

## Blanking Functions (Advanced Series Only)

### Fixed Blanking

This function is used when a machine or workpiece constantly interrupts beams in a part of the sensing area. Fixed blanking allows the Safety Light Curtain to remain in the Machine Run State while the obstruction in the sensing area as a non-moving object. The output is turned OFF when a beam other than the set fixed blanking beams is interrupted, or when light is incident on a fixed blanking beam.

### Floating Blanking

This function turns OFF the output when the total number of interrupted beams inside the sensing area exceeds the number of set beams (1 or 2).

### Monitored Blanking

This function is used when a machine or workpiece constantly interrupts beams in a part of the sensing area and moves within the sensing area. Monitored blanking allows the Safety Light Curtain to remain in the Machine Run State while the obstruction moves within the sensing area. The output is turned OFF when the machine or workpiece disappears from the monitored blanking area that was set by teaching, or when the total number of interrupted beams increases due to a different obstruction.

### Reduced Resolution Blanking

When the resolution of the MS/MSF4800A is reduced, the size of the minimum detectable object is increased. The output will not turn OFF regardless of how many continuous interrupted beams there are in the sensing area as long as the beams are fewer than the set number (1, 2, or 3 beams).
When an object whose size exceeds the set number of beams intrudes, the output is turned OFF. For example, in an application where a conveyor cart approaches a robot work area, the Safety Light Curtain can be set so that it does not detect only the wheels of the cart, allowing the MS/MSF4800A to be used as a presence sensing device.

## Muting Functions (MSF4800A Only)

Use of the MS4800-RM6 Resource Module (sold separately) makes it possible to temporarily disable the Safety Light Curtain. Select from among four muting modes to match each application with the appropriate number and placement of muting sensors.

**Note:** For details on blanking and muting, refer to the *Mini Safe 4800 Series Safety Light Curtains Installation and Operating Manual*.

## Diagnostic Functions

### External Device Monitoring (EDM) (MPCE Monitoring)

This function detects malfunctions, such as welded contacts in external relays (or contactors) that control the hazardous area of a machine. This function constantly monitors that a specified voltage is applied to the Receiver's external device monitoring input line, and enters LOCKOUT state when an error occurs. The relay's operational delay can be up to 300 ms without being evaluated as an error.
To utilize this function properly, use relays and contactors that have a forcibly guided contact structure.

#### Enabling/Disabling External Device Monitoring

The external device monitoring can be enabled or disabled with the Programming and Diagnostics Module. When using the Auto Start Mode, enabling and disabling can be switched by combining the start input line with the external device monitoring wiring.

**Note:** For details, refer to the *Mini Safe 4800 Series Safety Light Curtains Installation and Operating Manual*.

### Machine Test Signal (MTS)

The Machine Test Signal (MTS) is used to confirm that the safety system stops correctly when an MS/MSF4800 beam is interrupted by purposely halting the emission with an external signal. MTS is provided by placing a normally closed switch across the MTS and MTS Return lines of the Transmitter. A close-to-open transition on this switch will enable the MTS and halt the emission.

## Other Functions

### Sensing Distance Selection

The Programming and Diagnostics Module can be used to select the sensing distance. The Short Range Mode is 8 m, and the Long Range Mode is 20 m (default). This function is useful when there are many Safety Light Curtains operating within a small space and the possibility of mutual interference is likely.

### Response Time Adjustment (MS/MSF4800A Only)

The MS4800 allows the user to slow down the scan rate of the Safety Light Curtain for maximum immunity against environmental interference. This function may be used in harsh environmental conditions where electrical noise, ambient smoke, or dust and flying debris interfere with the Safety Light Curtain. For details, refer to ***Response Time*** on page 257.

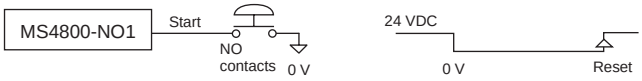
**⚠ WARNING**

**Recalculate the safety distance whenever the response time has been changed.**

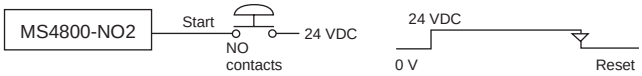
### Start Input Methods (MS/MSF4800A Only)

For the MS/MSF4800A, select one of the following four combinations of switch and ON/OFF logic for connection to the Start Input line. (The default is the 0-V connection with NC contacts.) As the following timing chart shows, the switch is reset by pressing it once, then returning it.

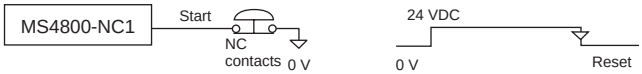
#### NO1: Normally Open (with 0-VDC Connection)



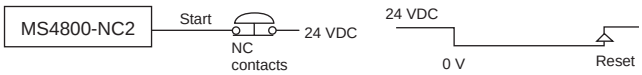

#### NO2: Normally Open (with 24-VDC Connection)




#### NC1: Normally Closed (with 0-VDC Connection) (Default)




#### NC2: Normally Closed (with 24-VDC Connection) (Default)




### Optical Synchronization

The synchronization between the MS4800-series Transmitter and Receiver is optical. To establish synchronization, the system needs to have a certain number of consecutive clear beams.

**Note:** For details, refer to the *Mini Safe 4800 Series Safety Light Curtains Installation and Operating Manual*.

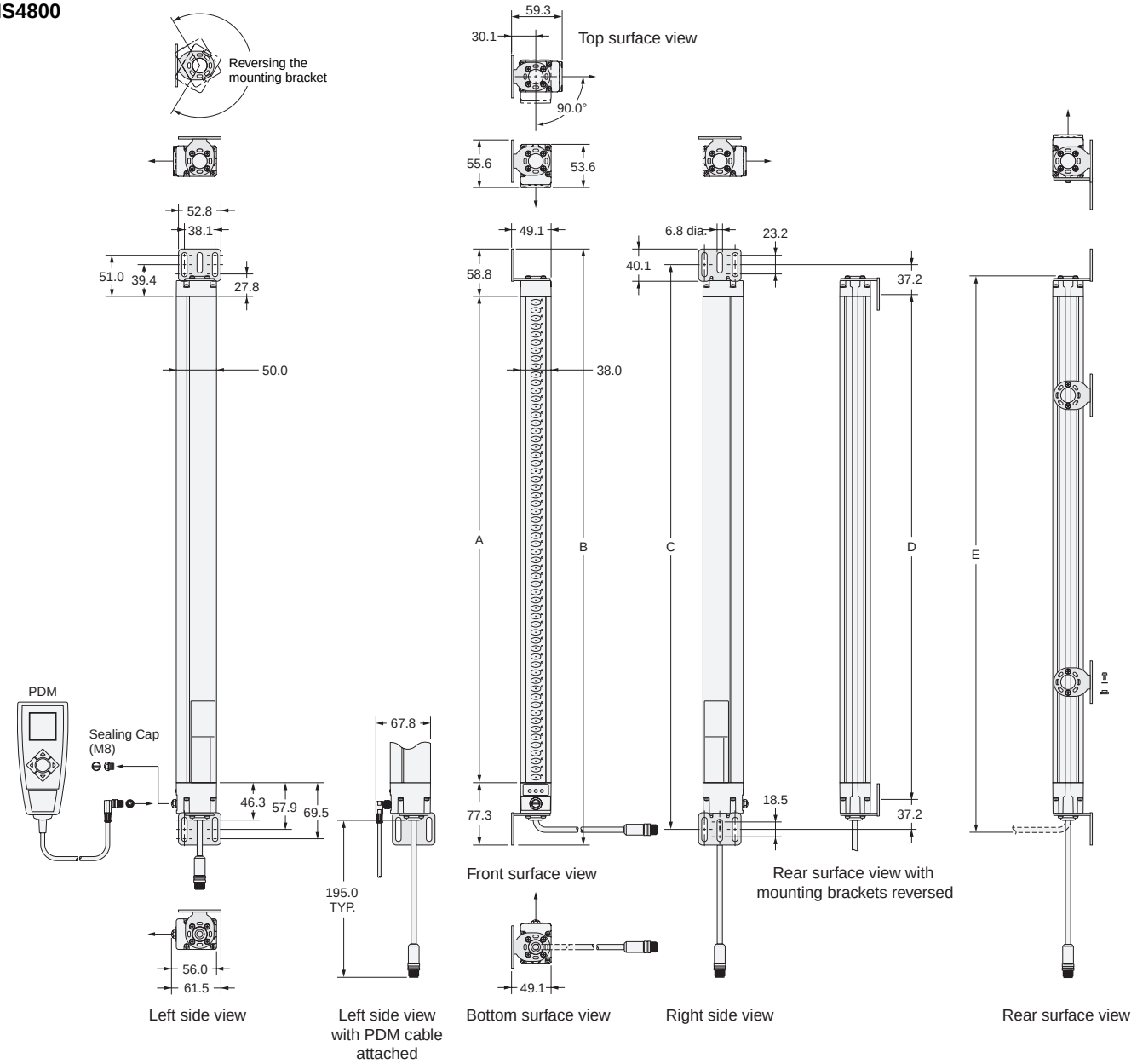
# Dimensions

(Unit: mm)

## Safety Light Curtains

### Safety Light Curtains Used Individually

**MS4800**



### MS4800-30 Transmitter and Receiver Dimensions

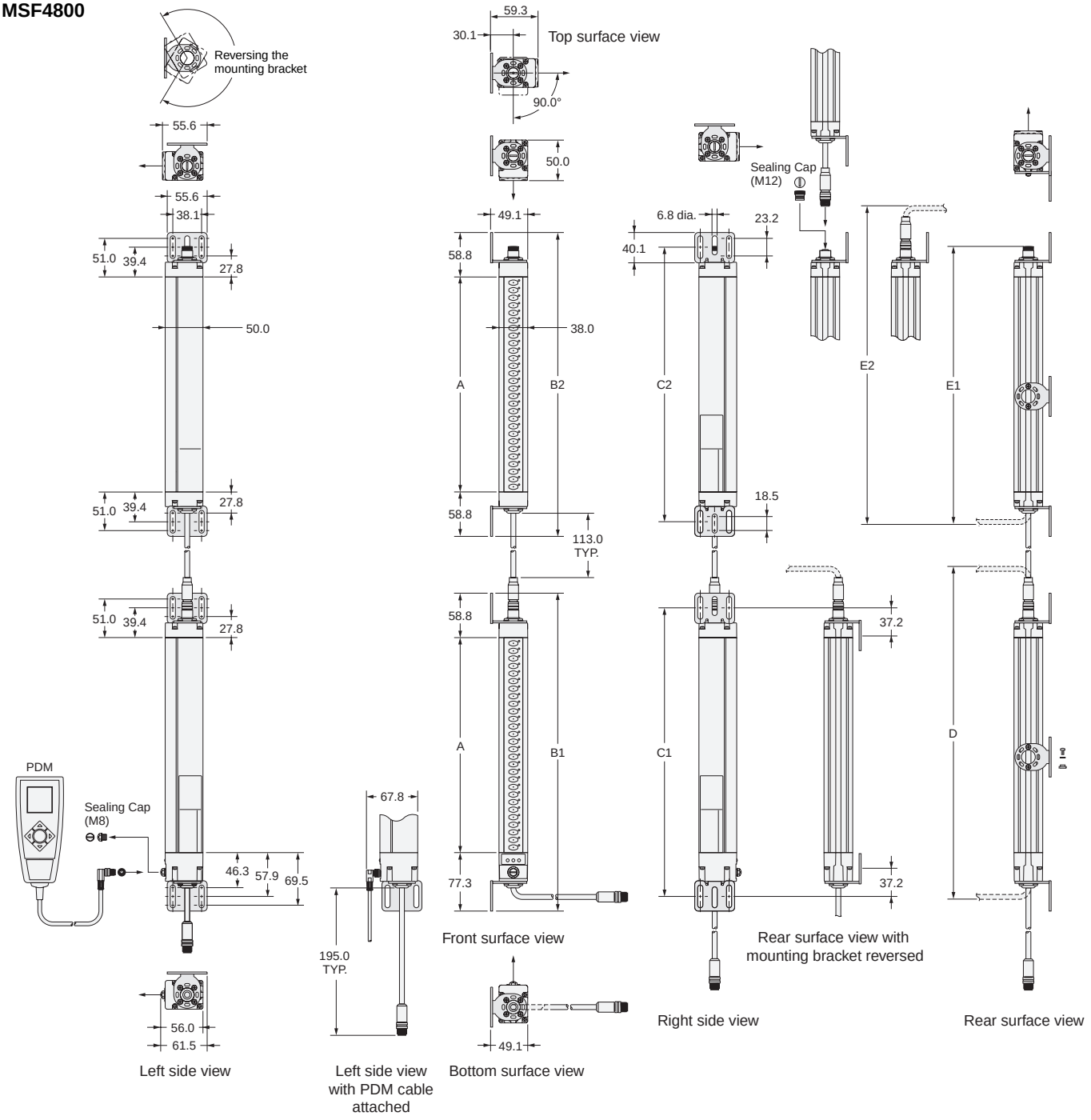
| Dimensions / Sensing area | A | B | C | D | E |
|---|---|---|---|---|---|
| 280 | 284.4 | 420.4 | 381.7 | 307.3 | 371.3 |
| 320 | 324.8 | 460.8 | 422.1 | 347.7 | 411.7 |
| 360 | 364.5 | 500.5 | 461.8 | 387.4 | 451.4 |
| 400 | 404.2 | 540.2 | 501.5 | 427.1 | 491.1 |
| 440 | 443.9 | 579.9 | 541.2 | 466.8 | 530.8 |
| 480 | 484.3 | 620.3 | 581.6 | 507.2 | 571.2 |
| 520 | 523.4 | 659.4 | 620.7 | 546.3 | 610.3 |
| 560 | 563.7 | 699.7 | 661.0 | 586.6 | 650.6 |
| 600 | 604.1 | 740.1 | 701.4 | 627.0 | 691.0 |
| 640 | 643.9 | 779.9 | 741.2 | 666.8 | 730.8 |
| 680 | 683.6 | 819.6 | 780.9 | 706.5 | 770.5 |
| 720 | 724.0 | 860.0 | 821.3 | 746.9 | 810.9 |
| 760 | 763.0 | 899.0 | 860.3 | 785.9 | 849.9 |
| 800 | 803.5 | 939.5 | 900.8 | 826.4 | 890.4 |
| 840 | 843.8 | 979.8 | 941.1 | 866.7 | 930.7 |
| 880 | 882.8 | 1018.8 | 980.1 | 905.7 | 969.7 |
| 920 | 922.5 | 1058.5 | 1019.8 | 945.4 | 1009.4 |
| 960 | 963.6 | 1099.6 | 1060.9 | 986.5 | 1050.5 |
| 1000 | 1002.6 | 1138.6 | 1099.9 | 1025.5 | 1089.5 |
| 1040 | 1042.9 | 1178.9 | 1140.2 | 1065.8 | 1129.8 |
| 1080 | 1083.9 | 1219.9 | 1181.2 | 1106.8 | 1170.8 |
| 1120 | 1122.3 | 1258.3 | 1219.6 | 1145.2 | 1209.2 |
| 1160 | 1162.7 | 1298.7 | 1260.0 | 1185.6 | 1249.6 |
| 1200 | 1203.8 | 1339.8 | 1301.1 | 1226.7 | 1290.7 |
| 1240 | 1242.1 | 1378.1 | 1339.4 | 1265.0 | 1329.0 |
| 1280 | 1281.8 | 1417.8 | 1379.1 | 1304.7 | 1368.7 |
| 1320 | 1323.6 | 1459.6 | 1420.9 | 1346.5 | 1410.5 |
| 1360 | 1362.0 | 1498.0 | 1459.3 | 1384.9 | 1448.9 |
| 1400 | 1401.7 | 1537.7 | 1499.0 | 1424.6 | 1488.6 |
| 1440 | 1443.4 | 1579.4 | 1540.7 | 1466.3 | 1530.3 |
| 1480 | 1481.8 | 1617.8 | 1579.1 | 1504.7 | 1568.7 |
| 1520 | 1521.5 | 1657.5 | 1618.8 | 1544.4 | 1608.4 |
| 1560 | 1563.3 | 1699.3 | 1660.6 | 1586.2 | 1650.2 |
| 1600 | 1600.9 | 1736.9 | 1698.2 | 1623.8 | 1687.8 |
| 1640 | 1641.3 | 1777.3 | 1738.6 | 1664.2 | 1728.2 |
| 1680 | 1681.3 | 1817.3 | 1778.6 | 1704.2 | 1768.2 |
| 1720 | 1720.8 | 1856.8 | 1818.1 | 1743.7 | 1807.7 |
| 1760 | 1760.5 | 1896.5 | 1857.8 | 1783.4 | 1847.4 |
| 1800 | 1802.9 | 1938.9 | 1900.2 | 1825.8 | 1889.8 |
| 1840 | 1840.6 | 1976.6 | 1937.9 | 1863.5 | 1927.5 |
| 1880 | 1880.3 | 2016.3 | 1977.6 | 1903.2 | 1967.2 |
| 1920 | 1922.8 | 2058.8 | 2020.1 | 1945.7 | 2009.7 |
| 1960 | 1960.4 | 2096.4 | 2057.7 | 1983.3 | 2047.3 |
| 2000 | 2000.1 | 2136.1 | 2097.4 | 2023.0 | 2087.0 |
| 2040 | 2042.6 | 2178.6 | 2139.9 | 2065.5 | 2129.5 |
| 2080 | 2079.6 | 2215.6 | 2176.9 | 2102.5 | 2166.5 |
| 2120 | 2120.0 | 2256.0 | 2217.3 | 2142.9 | 2206.9 |

### MS4800-40 Transmitter and Receiver Dimensions

| Dimensions / Sensing area | A | B | C | D | E |
|---|---|---|---|---|---|
| 360 | 364.5 | 500.5 | 461.8 | 387.4 | 451.4 |
| 480 | 484.3 | 620.3 | 581.6 | 507.2 | 571.2 |
| 600 | 604.1 | 740.1 | 701.4 | 627.0 | 691.0 |
| 720 | 724.0 | 860.0 | 821.3 | 746.9 | 810.9 |
| 840 | 843.4 | 979.4 | 940.7 | 866.3 | 930.3 |
| 960 | 963.6 | 1099.6 | 1060.9 | 986.5 | 1050.5 |
| 1080 | 1083.9 | 1219.9 | 1181.2 | 1106.8 | 1170.8 |
| 1200 | 1203.8 | 1339.8 | 1301.1 | 1226.7 | 1290.7 |
| 1320 | 1323.6 | 1459.6 | 1420.9 | 1346.5 | 1410.5 |
| 1440 | 1443.4 | 1579.4 | 1540.7 | 1466.3 | 1530.3 |
| 1560 | 1563.3 | 1699.3 | 1660.6 | 1586.2 | 1650.2 |
| 1680 | 1683.1 | 1819.1 | 1780.4 | 1706.0 | 1770.0 |
| 1800 | 1802.9 | 1938.9 | 1900.2 | 1825.8 | 1889.8 |
| 1920 | 1922.8 | 2058.8 | 2020.1 | 1945.7 | 2009.7 |
| 2040 | 2042.6 | 2178.6 | 2139.9 | 2065.5 | 2129.5 |

## Safety Light Curtains in Series Connection

### MSF4800



### MSF4800-30 Transmitter and Receiver Dimensions

| Dimensions / Sensing area | A | B1 | B2 | C1 | C2 | D | E1 | E2 |
|---|---|---|---|---|---|---|---|---|
| 240 | 244.6 | 380.6 | 362.1 | 341.9 | 323.3 | 400.2 | 327.9 | 381.6 |
| 280 | 284.4 | 420.4 | 401.9 | 381.7 | 363.1 | 440.0 | 367.7 | 421.4 |
| 320 | 324.8 | 460.8 | 442.3 | 422.1 | 403.5 | 480.4 | 408.1 | 461.8 |
| 360 | 364.5 | 500.5 | 482.0 | 461.8 | 443.2 | 520.1 | 447.8 | 501.5 |
| 400 | 404.2 | 540.2 | 521.7 | 501.5 | 482.9 | 559.8 | 487.5 | 541.2 |
| 440 | 443.9 | 579.9 | 561.4 | 541.2 | 522.6 | 599.5 | 527.2 | 580.9 |
| 480 | 484.3 | 620.3 | 601.8 | 581.6 | 563.0 | 639.9 | 567.6 | 621.3 |
| 520 | 523.4 | 659.4 | 640.9 | 620.7 | 602.1 | 679.0 | 606.7 | 660.4 |
| 560 | 563.7 | 699.7 | 681.2 | 661.0 | 642.4 | 719.3 | 647.0 | 700.7 |
| 600 | 604.1 | 740.1 | 721.6 | 701.4 | 682.8 | 759.7 | 687.4 | 741.1 |
| 640 | 643.9 | 779.9 | 761.4 | 741.2 | 722.6 | 799.5 | 727.2 | 780.9 |
| 680 | 683.6 | 819.6 | 801.1 | 780.9 | 762.3 | 839.2 | 766.9 | 820.6 |
| 720 | 724.0 | 860.0 | 841.5 | 821.3 | 802.7 | 879.6 | 807.3 | 861.0 |
| 760 | 763.0 | 899.0 | 880.5 | 860.3 | 841.7 | 918.6 | 846.3 | 900.0 |
| 800 | 803.5 | 939.5 | 921.0 | 900.8 | 882.2 | 959.1 | 886.8 | 940.5 |
| 840 | 843.8 | 979.8 | 961.3 | 941.1 | 922.5 | 999.4 | 927.1 | 980.8 |
| 880 | 882.8 | 1018.8 | 1000.3 | 980.1 | 961.5 | 1038.4 | 966.1 | 1019.8 |
| 920 | 922.5 | 1058.5 | 1040.0 | 1019.8 | 1001.2 | 1078.1 | 1005.8 | 1059.5 |
| 960 | 963.6 | 1099.6 | 1081.1 | 1060.9 | 1042.3 | 1119.2 | 1046.9 | 1100.6 |
| 1000 | 1002.6 | 1138.6 | 1120.1 | 1099.9 | 1081.3 | 1158.2 | 1085.9 | 1139.6 |
| 1040 | 1042.9 | 1178.9 | 1160.4 | 1140.2 | 1121.6 | 1198.5 | 1126.2 | 1179.9 |
| 1080 | 1083.9 | 1219.9 | 1201.4 | 1181.2 | 1162.6 | 1239.5 | 1167.2 | 1220.9 |
| 1120 | 1122.3 | 1258.3 | 1239.8 | 1219.6 | 1201.0 | 1277.9 | 1205.6 | 1259.3 |
| 1160 | 1162.7 | 1298.7 | 1280.2 | 1260.0 | 1241.4 | 1318.3 | 1246.0 | 1299.7 |
| 1200 | 1203.8 | 1339.8 | 1321.3 | 1301.1 | 1282.5 | 1359.4 | 1287.1 | 1340.8 |
| 1240 | 1242.1 | 1378.1 | 1359.6 | 1339.4 | 1320.8 | 1397.7 | 1325.4 | 1379.1 |
| 1280 | 1281.8 | 1417.8 | 1399.3 | 1379.1 | 1360.5 | 1437.4 | 1365.1 | 1418.8 |
| 1320 | 1323.6 | 1459.6 | 1441.1 | 1420.9 | 1402.3 | 1479.2 | 1406.9 | 1460.6 |
| 1360 | 1362.0 | 1498.0 | 1479.5 | 1459.3 | 1440.7 | 1517.6 | 1445.3 | 1499.0 |
| 1400 | 1401.7 | 1537.7 | 1519.2 | 1499.0 | 1480.4 | 1557.3 | 1485.0 | 1538.7 |
| 1440 | 1443.4 | 1579.4 | 1560.9 | 1540.7 | 1522.1 | 1599.0 | 1526.7 | 1580.4 |
| 1480 | 1481.8 | 1617.8 | 1599.3 | 1579.1 | 1560.5 | 1637.4 | 1565.1 | 1618.8 |
| 1520 | 1521.5 | 1657.5 | 1639.0 | 1618.8 | 1600.2 | 1677.1 | 1604.8 | 1658.5 |
| 1560 | 1563.3 | 1699.3 | 1680.8 | 1660.6 | 1642.0 | 1718.9 | 1646.6 | 1700.3 |
| 1600 | 1600.9 | 1736.9 | 1718.4 | 1698.2 | 1679.6 | 1756.5 | 1684.2 | 1737.9 |
| 1640 | 1641.3 | 1777.3 | 1758.8 | 1738.6 | 1720.0 | 1796.9 | 1724.6 | 1778.3 |
| 1680 | 1683.1 | 1819.1 | 1800.6 | 1780.4 | 1761.8 | 1838.7 | 1766.4 | 1820.1 |
| 1720 | 1720.8 | 1856.8 | 1838.3 | 1818.1 | 1799.5 | 1876.4 | 1804.1 | 1857.8 |
| 1760 | 1760.5 | 1896.5 | 1878.0 | 1857.8 | 1839.2 | 1916.1 | 1843.8 | 1897.5 |
| 1800 | 1802.9 | 1938.9 | 1920.4 | 1900.2 | 1881.6 | 1958.5 | 1886.2 | 1939.9 |
| 1840 | 1840.6 | 1976.6 | 1958.1 | 1937.9 | 1919.3 | 1996.2 | 1923.9 | 1977.6 |
| 1880 | 1880.3 | 2016.3 | 1997.8 | 1977.6 | 1959.0 | 2035.9 | 1963.6 | 2017.3 |
| 1920 | 1922.8 | 2058.8 | 2040.3 | 2020.1 | 2001.5 | 2078.4 | 2006.1 | 2059.8 |
| 1960 | 1960.4 | 2096.4 | 2077.9 | 2057.7 | 2039.1 | 2116.0 | 2043.7 | 2097.4 |
| 2000 | 2000.1 | 2136.1 | 2117.6 | 2097.4 | 2078.8 | 2155.7 | 2083.4 | 2137.1 |
| 2040 | 2042.6 | 2178.6 | 2160.1 | 2139.9 | 2121.3 | 2198.2 | 2125.9 | 2179.6 |
| 2080 | 2079.6 | 2215.6 | 2197.1 | 2176.9 | 2158.3 | 2235.2 | 2162.9 | 2216.6 |
| 2120 | 2120.0 | 2256.0 | 2237.5 | 2217.3 | 2198.7 | 2275.6 | 2203.3 | 2257.0 |

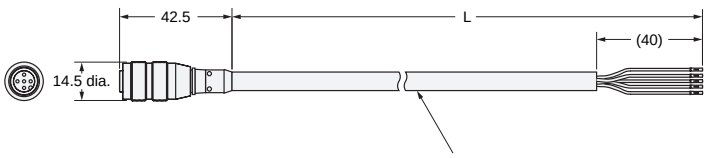
### MSF4800-40 Transmitter and Receiver Dimensions

| Dimensions / Sensing area | A | B1 | B2 | C1 | C2 | D | E1 | E2 |
|---|---|---|---|---|---|---|---|---|
| 360 | 364.5 | 500.5 | 482.0 | 461.8 | 443.2 | 520.1 | 447.8 | 501.5 |
| 480 | 484.3 | 620.3 | 601.8 | 581.6 | 563.0 | 639.9 | 567.6 | 621.3 |
| 600 | 604.1 | 740.1 | 721.6 | 701.4 | 682.8 | 759.7 | 687.4 | 741.1 |
| 720 | 724.0 | 860.0 | 841.5 | 821.3 | 802.7 | 879.6 | 807.3 | 861.0 |
| 840 | 843.8 | 979.8 | 961.3 | 941.1 | 922.5 | 999.4 | 927.1 | 980.8 |
| 960 | 963.6 | 1099.6 | 1081.1 | 1060.9 | 1042.3 | 1119.2 | 1046.9 | 1100.6 |
| 1080 | 1083.9 | 1219.9 | 1201.4 | 1181.2 | 1162.6 | 1239.5 | 1167.2 | 1220.9 |
| 1200 | 1203.4 | 1339.4 | 1320.9 | 1300.7 | 1282.1 | 1359.0 | 1286.7 | 1340.4 |
| 1320 | 1323.6 | 1459.6 | 1441.1 | 1420.9 | 1402.3 | 1479.2 | 1406.9 | 1460.6 |
| 1440 | 1443.4 | 1579.4 | 1560.9 | 1540.7 | 1522.1 | 1599.0 | 1526.7 | 1580.4 |
| 1560 | 1563.3 | 1699.3 | 1680.8 | 1660.6 | 1642.0 | 1718.9 | 1646.6 | 1700.3 |
| 1680 | 1681.3 | 1817.3 | 1798.8 | 1778.6 | 1760.0 | 1836.9 | 1764.6 | 1818.3 |
| 1800 | 1802.9 | 1938.9 | 1920.4 | 1900.2 | 1881.6 | 1958.5 | 1886.2 | 1939.9 |
| 1920 | 1922.8 | 2058.8 | 2040.3 | 2020.1 | 2001.5 | 2078.4 | 2006.1 | 2059.8 |
| 2040 | 2042.6 | 2178.6 | 2160.1 | 2139.9 | 2121.3 | 2198.2 | 2125.9 | 2179.6 |

## Accessories

### Cables with Connector on One End for Transmitter

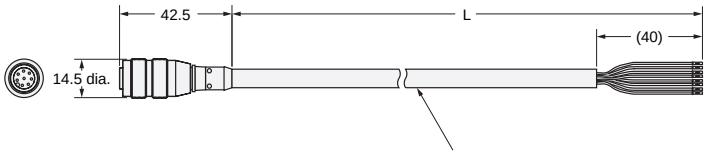
**MS4800-CBLTX-10M (L = 10 m)**
**MS4800-CBLTX-15M (L = 15 m)**
**MS4800-CBLTX-30M (L = 30 m)**




7-dia. vinyl-insulated round cable (black) with 5 conductors
(Conductor Cross Section: 0.32 mm², Insulation diameter: 1.3 mm),
Standard length L: 10, 15, or 30 m

### Cables with Connector on One End for Receiver

**MS4800-CBLRX-10M (L = 10 m)**
**MS4800-CBLRX-15M (L = 15 m)**
**MS4800-CBLRX-30M (L = 30 m)**




7-dia. vinyl-insulated round cable (black) with 8 conductors*
Standard length L: 10, 15, or 30 m)

*

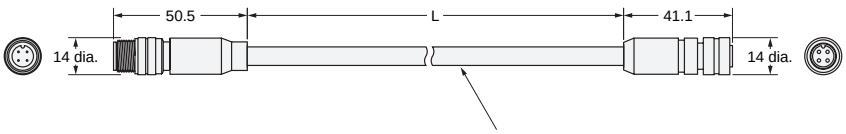
| Wire color | Conductor cross sectional area (mm²) | Insulation outside diameter (mm) |
|---|---|---|
| Brown | 0.52 | 1.6 dia. |
| Blue | 0.52 | 1.6 dia. |
| Green | 0.52 | 1.6 dia. |
| White | 0.32 | 1.3 dia. |
| Yellow | 0.2 | 1.2 dia. |
| Red | 0.2 | 1.2 dia. |
| Pink | 0.32 | 1.3 dia. |
| Black | 0.32 | 1.3 dia. |

### Series Connection Cables for Transmitter

**MS4800-CBLTXIC-003M (L = 0.3 m)**
**MS4800-CBLTXIC-005M (L = 0.5 m)**
**MS4800-CBLTXIC-01M (L = 1 m)**
**MS4800-CBLTXIC-02M (L = 2 m)**
**MS4800-CBLTXIC-03M (L = 3 m)**
**MS4800-CBLTXIC-05M (L = 5 m)**
**MS4800-CBLTXIC-10M (L = 10 m)**

### Series Connection Cables for Receiver

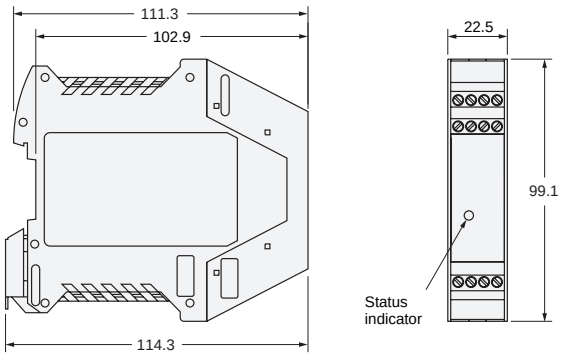
**MS4800-CBLRXIC-003M (L = 0.3 m)**
**MS4800-CBLRXIC-005M (L = 0.5 m)**
**MS4800-CBLRXIC-01M (L = 1 m)**
**MS4800-CBLRXIC-02M (L = 2 m)**
**MS4800-CBLRXIC-03M (L = 3 m)**
**MS4800-CBLRXIC-05M (L = 5 m)**
**MS4800-CBLRXIC-10M (L = 10 m)**




7-dia. vinyl-insulated round cable (black) with 4 conductors
(2 twisted pairs)
(Conductor Cross Section: 0.2 mm²),
Standard length L: 0.3, 0.5, 1, 2, 3, 5, or 10 m

### Resource Module

**MS4800-RM6**



# Safety Precautions

This document is intended as a guide for product selection. Be sure to read the *Instruction Manual* provided with the product for actual operation.

## Regulations and Standards

**1.** Application of an MS/MSF4800-series Safety Light Curtain alone cannot receive type certification provided by Article 44-2 of the Industrial Safety and Health Law of Japan. It is necessary to apply the Curtain in a system. Therefore, when using the MS/MSF4800-series Safety Light Curtain in Japan as a "safety device for presses or shearing machines" prescribed in Article 42 of that law, the system must receive type certification.

**2.** The MS/MSF4800-series Safety Light Curtain is electro-sensitive protective equipment (ESPE) in accordance with European Union (EU) Machinery Directive Index Annex IV, B, Safety Components, Item 1.

**3.** The MS/MSF4800-series Safety Light Curtain complies with the following legislation and standards:

(1) EU Regulations
Machinery Directive: Directive 98/37/EC
EMC Directive: Directive 89/336/EEC

(2) European standards:
EN 61496-1 (TYPE 4 ESPE)
prEN 61496-2 (TYPE 4 AOPD)
EN 61508-1 to -7 (SIL3)
EN 954-1 (Category B, 1, 2, 3, 4)

(3) International standards:
IEC 61496-1 (TYPE 4 ESPE)
IEC 61496-2 (TYPE 4 AOPD)
EN 61508-1 to -7 (SIL3)

(4) JIS standards:
JIS B9704-1 (TYPE 4 ESPE)
JIS B9704-2 (TYPE 4 AOPD)

(5) North American standards:
UL 61496-1 (Type 4 ESPE)
UL 61496-2 (Type 4 AOPD)
UL 508, UL 1998, CAN/CSA 22.2 No. 14
CAN/CSA 22.2 No. 0.8

**4.** The MS/MSF4800 received the following certification from TÜV Rheinland, an EU-accredited body:
- EC type test based on Machinery Directive
  Type 4 ESPE (IEC 61496-1)
  Type 4 AOPD (IEC 61496-2)
- TÜV Rheinland type certification
  Type 4 ESPE (IEC 61496-1)
  Type 4 AOPD (IEC 61496-2)
- SIL3 (IEC 61508)

**5.** The MS/MSF4800 has received certificates for UL listing for US and Canadian safety standards from UL, a third party assessment body.
- Type 4 ESPE (UL 61496-1)
  Type 4 AOPD (UL 61496-2)

**6.** The MS/MSF4800 is designed according to the standards listed below. To make sure that the final system complies with the following standards and regulations, you are asked to design and use it in accordance with all other related standards, laws, and regulations.
If you have any questions, consult with UL or other specialized organizations.
- European standards: EN 415-4, EN 692, EN 693
- US Occupational Safety and Health Administration: OSHA 29 CFR 1910.212
- US Occupational Safety and Health Administration: OSHA 29 CFR 1910.217
- American National Standard Institute: ANSI B11.1 to B11.19
- American National Standard Institute: ANSI/RIA 15.06
- Canadian Standards Association: CSA Z142, Z432, Z434
- SEMI standard SEMI S2

# Precautions for Safe Use

## Indications and Meanings for Safe Use

To ensure safe use of the MS/MSF4800, signal words and an alert symbol are used in this document to indicate safety-related instructions. These instructions describe details very important to your safety. It is extremely important that you understand and follow the instructions. The signal words and alert symbol used in this document are shown below.

| | |
|---|---|
| ⚠ WARNING | **Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally, there may by significant property damage.** |

## Meaning of Symbol

| | |
|---|---|
|  | **General Prohibition**<br>**Indicates a general prohibition** |

## Warning Indications

⚠ **WARNING**

**The MS/MSF4800 is a safety area sensor that is designed to protect operators who work in hazardous environments, such as those containing operating machinery.**

**MS/MSF4800 safety levels for specific applications and installation conditions can be attained only by achieving safe usage, installation, maintenance, and operation of the MS/MSF4800. These factors must be thoroughly confirmed by the customer who purchased the MS/MSF4800, as well as installers and employers.**

## Precautions for Users

⚠ **WARNING**

**The MS/MSF4800 must be installed, set, and integrated into the mechanical control system by a qualified technician who has received the appropriate training. Installation by an unqualified person may prevent the MS/MSF4800 from operating correctly, with the result that people may go undetected, and serious injuries may occur.**

**When changing parameters with the Programming and Diagnostics Module, the change must be made and the contents of the change must be managed by the person in charge of the system. Unintentional or mistaken parameter changes may prevent detection of people and result in serious injury.**

**The manager of the system is responsible for the selection and training of personnel to properly install, operate, and maintain the machine and its safeguarding systems.**

**The MS/MSF4800 must be installed, verified, and maintained by a qualified person. A qualified person is defined as someone who holds credentials or certification proving that he or she has received relevant professional training, or someone whose ability to solve problems related to the specific matters or operations at hand has been verified by considerable knowledge, training or considerable experience. (See ANSI/PMMI B155.1-2006 for details.)**

## Machine Installation

⚠ **WARNING**

**Do not use this sensor for machines that cannot possibly be quickly stopped by electrical controls. For example, do not use it for a pressing machine that uses a full-rotation clutch. Otherwise, the machine may not stop before a person reaches the hazardous part, resulting in serious injury.**

**Do not use the auxiliary output for safety applications. Failure of the MS/MSF4800 may cause a person to go undetected, resulting in serious injury.**

**The guarded machine must not present a hazard from flying parts.**

**The guarded machine must have a consistent stopping time and adequate control mechanisms.**

**All safety-related machine control elements must be designed so that a failure in the control logic or a failure in the control circuit does not lead to danger.**

**Additional guarding may be required for access to dangerous areas not covered by the MS/MSF4800 system.**

## For mounting

⚠ **WARNING**

**Be sure to test the operation of the MS/MSF4800 after installation with the machine in a non-operating condition to verify that the MS/MSF4800 operates as intended. Unintended function settings may cause a person to go undetected, resulting in serious injury.**

**Be sure to secure the safety distance between the MS/MSF4800 and the hazardous parts. Otherwise, the machine may not stop before a person reaches the hazardous part, resulting in serious injury.**

**Install a protective structure so that the hazardous part of a machine can only be reached by passing through the sensor's detection zone. Install the sensors so that part of the person is always present in the detection zone when working in a machine's hazardous areas. If a person is able to step into the hazardous area of a machine and remain behind the MS/MSF4800's detection zone, configure the system with an interlock function that prevents the machine from being restarted. Otherwise it may result in heavy injury.**

**When using Start/Restart Interlock Mode, install the interlock reset switch in a location that provides a clear view of the entire hazardous area and where it cannot be activated from within the hazardous area.**

**The MS/MSF4800 cannot protect a person from an object flying from a hazardous area. Install protective cover(s) or fence(s).**

**When detection of an area has been disabled by the fixed blanking function, provide a protective structure around the entire area that will prevent a person from passing through it and reaching the hazardous part of the machinery. Failure to do so may prevent detection of people and result in serious injury.**

**After setting the fixed blanking function, be sure to confirm that a test rod is detected within all areas that require detection. Failure to do so may prevent detection of people and result in serious injury.**

**When the fixed blanking, floating blanking, monitored blanking, or reduced resolution blanking function is used, the diameter for the minimum detectable object becomes larger. Be sure to use the diameter for the minimum detectable object for the fixed blanking, floating blanking, monitored blanking, or reduced resolution blanking function when calculating the safety distance. Failure to do so may prevent the machinery from stopping before a person reaches the hazardous part of the machinery, and result in serious injury.**

**The muting and override functions disable the safety functions of the device. Additional safety measures must be taken to ensure safety while these functions are working.**

**Muting lamps that indicate the state of the muting and override functions must be installed where they are clearly visible to workers from all the operating positions.**

**Install Muting Sensors so that they can distinguish between the object that is being allowed to be passed through the detection zone and a person. If the muting function is activated by the detection of a person, it may result in serious injury.**

**Muting times must be precisely set according to the application by qualified personnel who have received appropriate training. In particular, if the muting time limit is to be set to infinity, the person who makes the setting must bear responsibility.**

**Use two independent input devices for the muting inputs.**

**Install the MS/MSF4800, Muting Sensors, or a protective wall so that workers cannot enter hazardous areas while muting is in effect, and set muting times.**

**Position the switch that is used to activate the override function in a location where the entire hazardous area can be seen, and where the switch cannot be operated from inside the hazardous area. Make sure that nobody is in the hazardous area before activating the override function.**

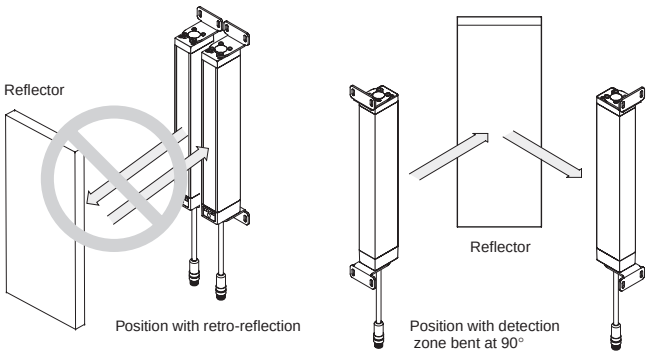
**Install the MS/MSF4800 so that it is not affected by reflective surfaces. Failure to do so may hinder detection, resulting in serious injury.**

**When using more than one set of MS/MSF4800, install them so that mutual interference does not occur, such as by configuring series connections, using physical, light-blocking barriers, or changing scan codes between adjacent sets.**

**Make sure that the MS/MSF4800 is securely mounted and its cables and connectors are properly connected.**

**Make sure that no foreign material, such as water, oil or dust, enters the MS/MSF4800 or connectors while caps are removed.**

**Do not use the sensor system with mirrors in a retro-reflective configuration as shown in the following diagram. Doing so may hinder detection. It is possible to use mirrors to "bend" the detection zone to a 90-degree angle.**




**Inspect all MS/MSF4800 systems as instructed in the *Mini Safe 4800 Series Light Curtains Installation and Operating Manual*. When using series connections, perform inspection of all connected MS/MSF4800 Curtains as instructed in the Manual.**

**Recalculate the safety distance whenever the response time has been changed.**

**Conduct all tests and repairs with the procedures given in the *Mini Safe 4800 Series Light Curtains Installation and Operating Manual*.**

**Conduct the test procedures given in the *Mini Safe 4800 Series Light Curtains Installation and Operating Manual* according to the periodic inspection system established by the employer. These test procedures must be conducted after performing maintenance, changing tools, setting up the system, making adjustments, or otherwise making changes to the MS/MSF4800 or the guarded machine. When more than one operator uses the guarded machine, or when the guarded machine is used in shifts, it is recommended that these test procedures be conducted after each operation change or shift change. It is necessary to confirm that the MS/MSF4800 and the safety system of the guarded machine function properly and that the machine stops as intended. If the test results in failure, there is a strong possibility that a serious accident could occur involving an operator.**

## Wiring Precautions

**⚠ WARNING**

**For an PNP output, connect the load between the output and 0 V line. Connecting the load between the output and +24 V line results in a dangerous condition because the operation mode is reversed to "ON when light is interrupted."**

**Do not interconnect an output line with the +24-V line. Otherwise, the output is always ON, creating a dangerous situation. Also, 0 V of the power supply must be grounded so that output does not turn ON due to grounding of the output line.**

**Configure the system by using the optimal number of control outputs that satisfy the requirements of the necessary safety category.**

**Do not connect the lines of the MS/MSF4800 to a DC power supply higher than 24 VDC +20%. Also, do not connect to an AC power supply. Otherwise, it may result in electric shock.**

**For the MS/MSF4800 to comply with IEC 61496-1 and UL 508, the DC power supply unit must satisfy all of the following conditions:**

- **Must be within rated power voltage (24 VDC ±20%).**
- **Must have tolerance against the total rated current of devices if it is connected to multiple devices.**
- **Must comply with EMC directives (industrial environment).**
- **Double or enhanced insulation must be applied between the primary and secondary circuits.**
- **Automatic recovery must be possible for overcurrent protection.**
- **Output holding time must be 20 ms or longer.**
- **Must satisfy output characteristic requirements for class 2 circuit or limited voltage current circuit defined by UL508.**
- **Must comply with the EMC, laws, and regulations of the country or region where the MS/MSF4800 is used. (For example, in the EU, the power supply must comply with the EMC Low Voltage Directive.)**

**Double or enhanced insulation from hazardous voltage must be applied to all input and output lines. Failure to do so may result in electric shock.**

**The cable extension length must be no greater than the specified length. Otherwise, the safety functions may fail to work properly, resulting in danger.**

## Other Precautions

**⚠ WARNING**

**To use the MS/MSF4800 in PSDI Mode (i.e., restarting cycle operation by the sensor), you must configure an appropriate control circuit between the MS/MSF4800 and the machine. For details about PSDI, refer to ANSI RIA 15.06-1999, OSHA 1910.217 (h), ANSI B11.2-1995 (R2005), and other relevant standards and regulations.**

**Do not try to disassemble, repair, or modify this product. Doing so may cause the safety functions to stop working properly.**

**Do not use the MS/MSF4800 in environments where flammable or explosive gases are present. Doing so may result in explosion.**

**Perform daily and 6-month inspections for the MS/MSF4800. Otherwise, the system may fail to work properly, resulting in serious injury.**

## Safety Distance

**⚠ WARNING**

**Be sure to secure the safety distance between the MS/MSF4800 and the hazardous part. Otherwise, the machine may not stop before a person reaches the hazardous part, resulting in serious injury.**

**Note:** The response time of a machine is the time period from when the machine receives a stop signal to when the machine's hazardous part stops. Measure the response time on the actual system. Also, periodically check that the response time of the machine has not changed.

### How to Calculate the Safety Distance Specified by International Standard ISO 13855-2002 (European Standard EN 999-1999) (Reference)

The following explanation is based on standard EN 999. This standard applies to Safety Light Curtains used in an industrial environment.

**Systems with a Detection Capability of 40 mm Max.**

Use the following calculation for a system that detects objects with a minimum detectable diameter of 40 mm max.

$S = (K \times T) + C$

Where,

S: The shortest distance (in mm) between the hazardous part and the detection point (edge, surface, or area).

K = 2000 mm/s

T: The time (in seconds) required to stop the entire system.

$T = t_1 + t_2$

t1: The response time (in seconds) of the Safety Light Curtain.

This response time is listed in the ***Response Time*** on page 257.

$t_2$ = Maximum time (in seconds) required to stop the machine.

C = 8 (d – 14 mm), however, this must be 0 or more.

d: Minimum detectable object (in mm) of the MS/MSF4800.

The following calculation is given as an example:

$S = (2000 \text{ mm/s} \times T) + 8 (d - 14 \text{ mm})$

This calculation applies to all shortest distance S values to 500 mm max. The S value must be 100 mm min.

If the above-described calculation results in an S value greater than 500 mm, use the following calculation:

For this calculation the S value must be 500 mm min.

$S = (1600 \text{ mm/s} \times T) + 8 (d - 14 \text{ mm})$

**Systems with a Detection Capability Greater Than 40 mm**

Use the following calculation for a system that detects objects with a minimum detectable diameter greater than 40 mm.

$S = (K \times T) + C$

Where,

S: The shortest distance (in mm) between the hazardous part and the detection point (edge, surface, or area).

K = 1600 mm/s

T: The time (in seconds) required to stop the entire system.

$T = t_1 + t_2$

$t_1$: The response time (in seconds) of the Safety Light Curtain. This is given in the ***Response Time*** on page 257.

$t_2$: Maximum time (in seconds) required to stop the machine.

C = 850 mm

The following calculation is given as an example:

$S = (1600 \text{ mm/s} \times T) + 850 \text{ mm}$

### How to Calculate the Safety Distance Specified by American Standard ANSI B11.19 (Reference)

If a person approaches the detection zone of the MS/MSF4800 perpendicularly, calculate the safety distance as shown below.

$Ds = K \times (Ts + Tc + Tr + Tbm) + Dpf$

Where,

Ds: Safety distance (in inches)

K: Approach speed to the detection zone (in inches)

Assuming that the operator is beginning to perform a manual task, the ANSI standard value for K is 63 inches/second. ANSI B11.19-2003 requires that the following factors be considered in determining the K value.

a. Movement of hands or arms

b. Twisting of the body or shoulder, or bending of the waist

c. Walking or running

Use the above-described factors to determine the approach speed for the actual application.

Ts: The time (in seconds) required to stop the machine.

Tc: The maximum response time (in seconds) of the machine's control circuit required to activate the braking device of the machine.

**Note:** Ts + Tc are normally measured simultaneously by a device for measuring the time required for stopping.

Tr: The response time (in seconds) for the MS/MSF4800. This is given in the ***Response Time*** on page 257.

Tbm: The stopping time (in seconds) added by a brake monitor before determining degradation in the machine stopping time.

If a machine has a brake monitor, "Tbm = Brake monitor setting time – (Ts + Tc)." If it has no brake monitor, it is necessary to increase the value added to the machine's stopping time somewhat to account for brake wear. For details, consult the manufacturer of the machine.

The depth penetration factor (Dpf) is related to the minimum detectable object diameter of the MS/MSF4800. Determine the minimum detectable object diameter (S) and the model number of the MS/MSF4800 that is being used, then obtain the Dpf directly from the following table, *Examples of Minimum Detectable Object (S), Additional Safety Distance (C), and Dpf*.

**Examples of Minimum Detectable Object (S), Additional Safety Distance (C), and Dpf**

| Model | Total number of beams disabled by fixed or floating blanking | Minimum detectable object diameter: S (mm) | Additional safety distance obtained by ISO 13855-2002 (European standard EN 999-1999) calculation: C (mm) C = 8 (S – 14) | Depth penetration factor using the ANSI calculation (Dpf) Dpf = 3.4 (S – 0.276) inches |
|---|---|---|---|---|
| MS/MSF4800-30 | None | 30 | 128 | 3.1 inches (78 mm) |
| | 1 | 50 | 850 (for S = 40 mm min.) | 5.76 inches (146 mm) |
| | 2 or more | Greater than 64 | | 36 inches (900 mm) |
| MS/MSF4800-40 | None | 40 | 850 (for S = 40 mm min.) | 4.4 inches (112 mm) |
| | 1 or more | Greater than 64 | | 36 inches (900 mm) |

## Installation

## Reflective Surface Interference

**⚠ WARNING**

**Install the MS/MSF4800 where it will not be affected by reflective surfaces. Failure to do so may prevent detection and result in serious injury.**

There is a possibility that reflective surfaces next to the sensing area may reflect light and prevent the detection of beam interruption due to obstacles within the area (refer to Figs. 1 to 5). Reflective surfaces may exist on parts of machinery, mechanical protective devices, or products. The minimum distance (d) must be set between the reflective object and the beam centerline of the MS/MSF4800 sensing area.

For information on how to test this condition, refer to the *Mini Safe 4800 Series Light Curtains Installation and Operating Manual*.

**Fig. 1 Example of Correct Installation with Proper Placement**

The interruption of the beam due to the obstacle is accurately detected. The reflective object is outside the directional angle.

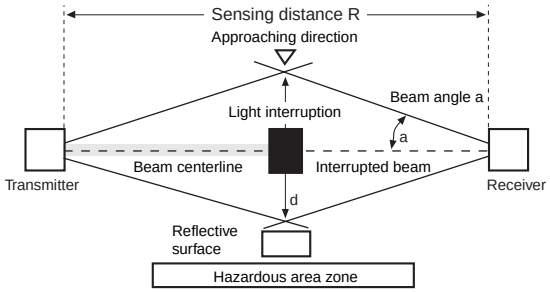



**Fig. 2 Example of Unsafe Installation**

Reflection prevents the obstacle from being detected. The reflective object is inside the beam angle.

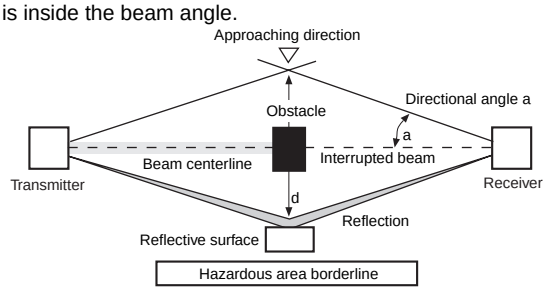



**Fig. 3 Example of Unsafe Installation**

The interruption of the beam due to the obstacle is not detected because of reflection. Reflective surface interference can occur from either above or below the sensing area.

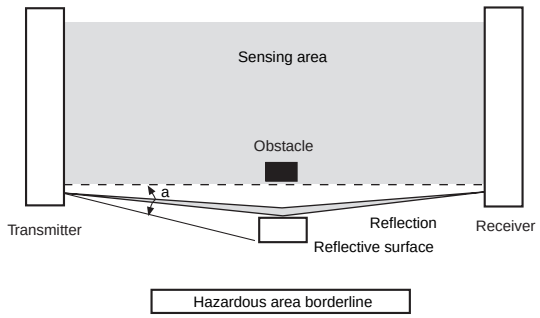



**Fig. 4 Worst Placement Example**

This example shows the minimum distance d from the reflective surface to one of the beam centerlines.

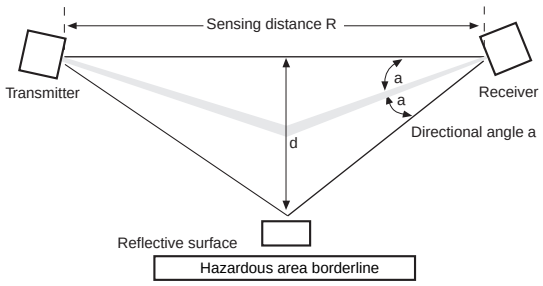
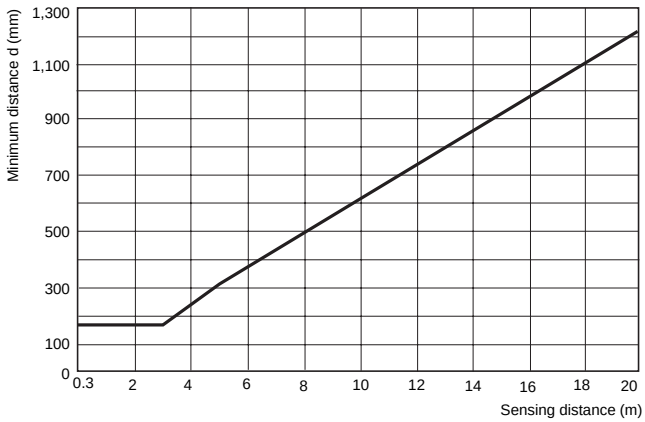



**Fig. 5 Sensing Distance vs. Minimum Distance from the Reflective Surface**




## Prevention of Mutual Interference

**⚠ WARNING**

**Do not use the sensor system with mirrors in a retro-reflective configuration. Doing so may hinder detection. It is possible to use mirrors to change the route of the light.**

**When using more than 1 set of MS/MSF4800, install them so that mutual interference does not occur, such as by configuring a series connection or using physical barriers between adjacent sets.**

The MS/ MSF4800 is equipped with two scan codes, A and B, to reduce mutual interference from other Safety Light Curtains. The Transmitter and Receiver must both be set to the same scan code to enable the Receiver to change to Machine Run State.

### Basic Installation Precautions

**⚠ WARNING**

**Install a protective structure so that the hazardous part of a machine can only be reached by passing through the sensor's detection zone. Install the sensors so that part of the person is always present in the detection zone when working in a machine's hazardous areas. If a person is able to step into the hazardous area of a machine and remain behind the MS/MSF4800's detection zone, configure the system with an interlock function that prevents the machine from being restarted. Otherwise it may result in heavy injury.**

**Do not use this sensor for machines that cannot possibly be quickly stopped by electrical controls. For example, do not use it for a pressing machine that uses a full-rotation clutch. Otherwise, the machine may not stop before a person reaches the hazardous part, resulting in serious injury.**

**Using the MS/MSF4800 in Presence Sensing Device Initiation (PSDI) Mode, which is used to restart machine cycle operation, requires that an appropriate control circuit be configured between the MS/MSF4800 and the guarded machine. For details on PSDI, refer to related standards and regulations, including ANSI RIA 15.06-1999, OSHA 1910.217(h), and ANSI B11.2-1995 (R2005).**

**When using the Start/Restart Interlock Mode, install the interlock reset switch in a location that provides a clear view of the entire hazardous area and where it cannot be activated from within the hazardous area.**

**Do not use the MS/MSF4800 in environments where flammable or explosive gases are present. Doing so may result in explosion.**

**The MS/MSF4800 cannot protect a person from an object flying from a hazardous area. Install protective cover(s) or fence(s).**

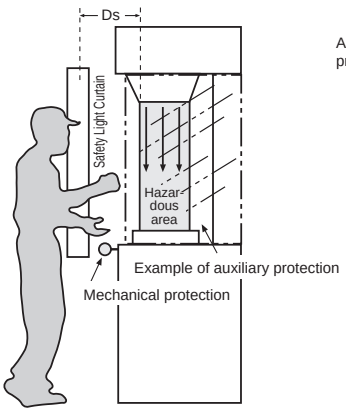
**Make sure that the MS/MSF4800 is securely mounted and its cables and connectors are properly connected.**

**Be sure to test the operation of the MS/MSF4800 after installation with the machine in a non-operating condition to verify that the MS/MSF4800 operates as intended. Unintended function settings may cause a person to go undetected, resulting in serious injury.**

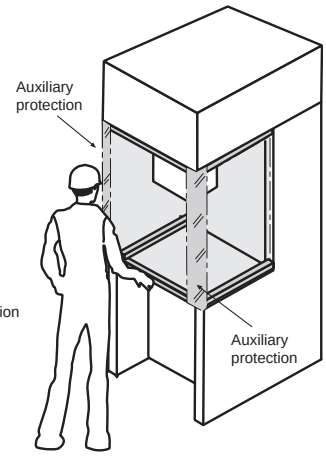
### Additional Protection

It is necessary to use an appropriate means, such as a fixed barrier guard, interlock guard, or safety mat, to protect areas that provide access to any hazardous areas of a machine that are not protected by the MS/MSF4800. See the examples in the following diagram.

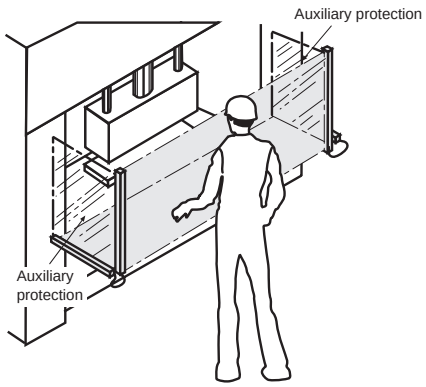
**Correct Safety Light Curtain Installation Examples**




Adding Mechanical Protection to the MS4800



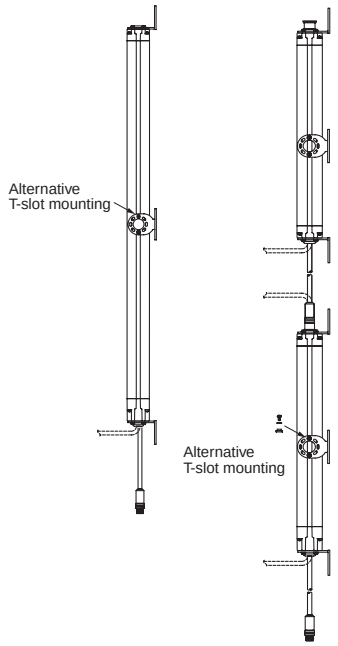

Three-directional MSF4800 Protection




Two-axis MSF4800 Protection

### Strengthening Rigidity during Installation

To increase rigidity, it is recommended that mounting brackets be added when installing an MS/MSF4800 system that has a length of 1,000 mm or more. Use the T-slot groove on the back of the MS/MSF4800 to install the mounting brackets to the rear surfaces of both the Transmitter and Receiver.

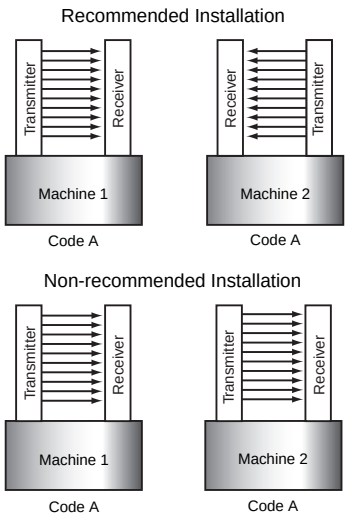



**Note:** When the alternate T-slot mounting is used to secure the MS/MSF4800, the mounting bracket can no longer be used to adjust the beams.

### Installing Multiple Systems

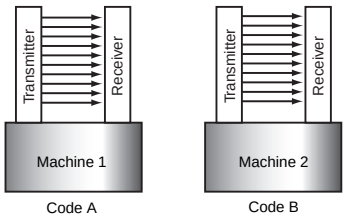
When installing two or more MS/MSF4800 systems with the same scan code in a line in close proximity, measures must be taken to prevent mutual interference between the systems. This problem can be solved by positioning Transmitters and Receivers back-to-back, or by stacking the systems.

### Staggering Positions When Installing Multiple Safety Light Curtains




The MS/MSF4800 scan code function can also be used to install multiple systems in a line in close proximity. Special coding for the light beams allows unique system operation, and can be used with other systems possessing different scan codes. The MS/MSF4800 is equipped with two scan codes.

### Setting the Scan Codes When Installing Multiple Safety Light Curtains




### Sensing Area

The sensing area of the MS/MSF4800 can be delineated by drawing lines from the inside edges of the End Caps on the Transmitter and Receiver. The area outside these lines is not sensed. Install the MS/MSF4800 so that it is not possible to enter the hazardous area without passing through the sensing area.

### Installation Adjustment

The installation adjustment for the Transmitter and Receiver is easiest when the system is in Auto Start Mode with the fixed blanking function disabled. Install the Transmitter and Receiver at the same height, on the same flat surface. The individual beam indicators (IBI) will turn ON when the beams are not aligned. For details, refer to ***Individual Beam Indicators (IBI)*** on page 264.

### Input Power Supply Requirements

The MS/MSF4800 operates at 24 VDC ±20%. The power supply for the MS/MSF4800 must satisfy the momentary power interruption and voltage drop requirements of IEC 61496-1 (4.3.2.2, 5.4.3.2) and IEC 60204-1 (4.3.3). Use the OMRON power supply with STI Parts No. 42992 or equivalent.

### Peripheral Protection Requirements

For peripheral protection, install the MS/MSF4800 so that its sensing area is outside the periphery of the guarded machine or robot. This installation method can be used to provide space for the operator to stand between the sensing area and the hazardous area. In this configuration, the guarded machine must be restartable only by using a key switch, and the key switch must be outside the hazardous operation area, in a location where the entire hazardous area is visible. Start/Restart Interlock Mode is well suited to peripheral protection applications.

### Minimum Detectable Object Diameter Indication

The serial number labels on the Transmitter and Receiver have marks for four minimum detectable object diameters. When installing the MS/MSF4800, use an oil-based marking pen to cross out the minimum detectable object diameters that were not set. The minimum detectable object diameter differs when floating blanking is not used and when floating blanking is set for one or two beams. For details, refer to the *Mini Safe 4800 Series Light Curtains Installation and Operating Manual*.

### Sensor Restart of Machine Cycle Operation (PSDI)

Using the Safety Light Curtain to initiate a machine cycle after an object is removed from the sensing area is called Presence Sensing Device Initiation (PSDI). Use of PSDI places additional requirements on the guarding and safety controls. It can restrict advanced Safety Light Curtain features such as floating blanking and fixed blanking. Details on PSDI can be found in ANSI RIA 15.06-1999, OSHA 1910.217(h), and ANSI B11.2-1995 (R2005).

### For wiring

**⚠ WARNING**

**For PNP output, connect the load between the output and 0 V line. Connecting the load between the output and +24 V line results in a dangerous condition because the operation mode is reversed to "ON when light is interrupted."**

**Do not interconnect an output line with a +24-V line. Otherwise, the output is always ON, creating a dangerous situation. Also, 0 V of the power supply must be grounded so that output does not turn ON due to grounding of the output line.**

**Configure the system by using the optimal number of control outputs that satisfy the requirements of the necessary safety category.**

**Do not connect the lines of the MS/MSF4800 to a DC power supply higher than 24 V +20%. Also, do not connect to an AC power supply. Otherwise, it may result in electric shock.**

**For the MS/MSF4800 to comply with IEC 61496-1 and UL 508, the DC power supply unit must satisfy all of the following conditions:**

- **Must be within rated power voltage (24 VDC ±20%).**
- **Must have tolerance against the total rated current of devices if it is connected to multiple devices.**
- **Must comply with EMC directives (industrial environment).**
- **Double or enhanced insulation must be applied between the primary and secondary circuits.**
- **Automatic recovery must be possible for overcurrent protection.**
- **Output holding time must be 20 ms or longer.**
- **Must satisfy output characteristic requirements for class 2 circuit or limited voltage current circuit defined by UL508.**
- **Must comply with the EMC, laws, and regulations of the country or region where the MS/MSF4800 is used. (For example, in the EU, the power supply must comply with the EMC Low Voltage Directive.)**

**Double or enhanced insulation from hazardous voltage must be applied to all input and output lines. Failure to do so may result in electric shock.**

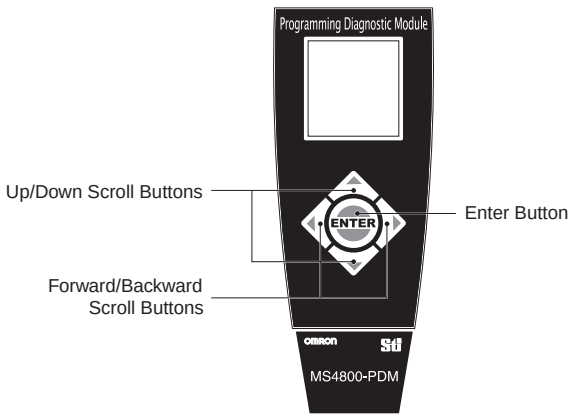
**The cable extension length must be no greater than the specified length. Otherwise, the safety functions may fail to work properly, resulting in danger.**

## Programming and Diagnostics Module

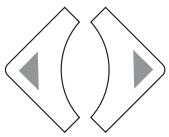
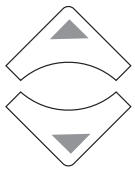
The MS/MSF4800-series Safety Light Curtains require the use of a Programming and Diagnostics Module (PDM) to program the operating parameters of the Light Curtain. In addition to Safety Light Curtain configuration, this Module also serves as a diagnostics device, allowing the user to retrieve fault information.

- Displays programming and diagnostics information on a multi-line LCD display.
- Supports English and Japanese languages. To switch between English and Japanese, continue to press the right Forward/Backward Scroll Button more than ten times at the log-in screen that appears after the PDM is connected to the MS/MSF4800.
- The housing is rated IP65, allowing permanent mounting near the Safety Light Curtain.

**Note:** The light curtain does not require the PDM to operate. The factory default settings allow for basic guarding operation.




### PDM Navigation Buttons

| Name | Shape | Description |
|---|---|---|
| Forward/ Backward Scroll Buttons |  | Scroll forward and backward to review the previous and next menu, or to move within the same screen. |
| Up/Down Scroll Buttons |  | Scroll up and down to review the selection of the current menu. |
| Enter Button |   | When pressed the selected function will be accessed. |

**Note:** For information on the operating method, refer to the *Mini Safe 4800 Series Safety Light Curtains Installation and Operating Manual.*

**In the interest of product improvement, specifications are subject to change without notice.**

**MEMO**

## Safety Light Curtain (Type 4)

# F3SJ Ver.2

## The updated F3SJ is even easier to use.

- The lineup also includes models with S-mark certification.
- New models for body protection or presence detection.

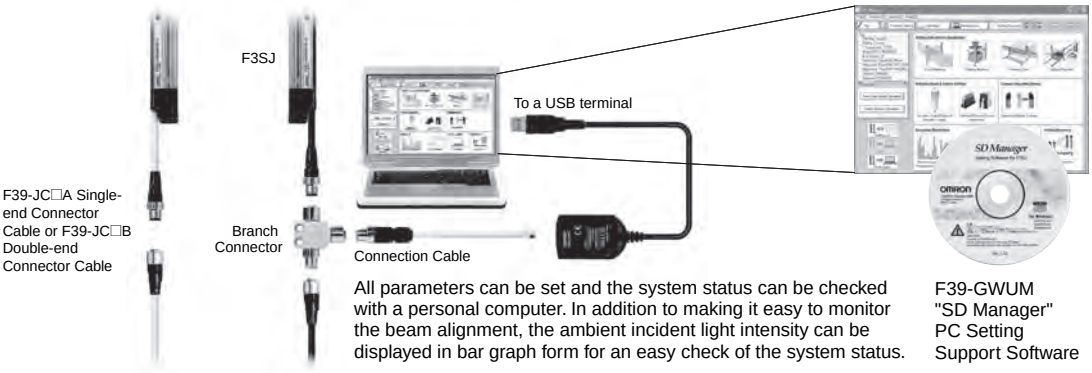


⚠ Be sure to read the *"Safety Precautions"* on page 346 and the *"Precautions for All Safety Sensors"* on page 242.

## Features

### Choose from two new tools for setting parameters and checking the system status.

#### "SD Manager" PC Setting Support Software




All parameters can be set and the system status can be checked with a personal computer. In addition to making it easy to monitor the beam alignment, the ambient incident light intensity can be displayed in bar graph form for an easy check of the system status.

F39-GWUM
"SD Manager" PC Setting Support Software

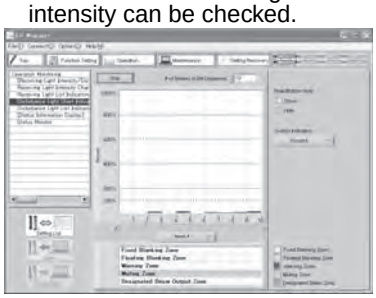
The "SD Manager" PC Setting Support Software helps reduce the time required for installing and troubleshooting the Safety Light Curtain.

● Beam alignment is easier.



The incident light level can be displayed in a bar graph for each beam.

● The ambient incident light intensity can be checked.



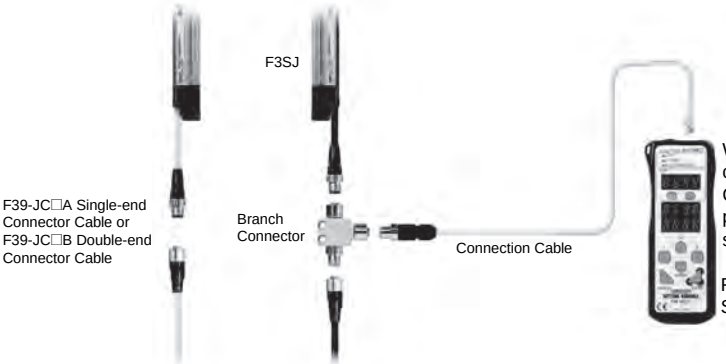
The incident light level when the light emission of the Safety Light Curtain is stopped is displayed in a bar graph.

● The error log can be displayed.



The cause of the errors and countermeasures are both displayed.

#### Setting Console




When you don't want to carry a personal computer onto the worksite, the Setting Console is a handy way to set parameters and check the system status.

F39-MC21
Setting Console for the F3SJ

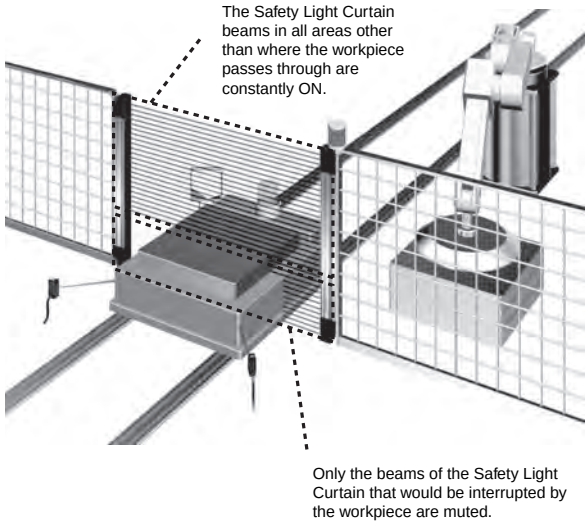
**Note:** The range of parameter setting and system status checking capabilities is different for the PC Setting Support Software and the Setting Console.

# New functions respond to a variety of safety needs.

## Two new functions have been added to the muting function.

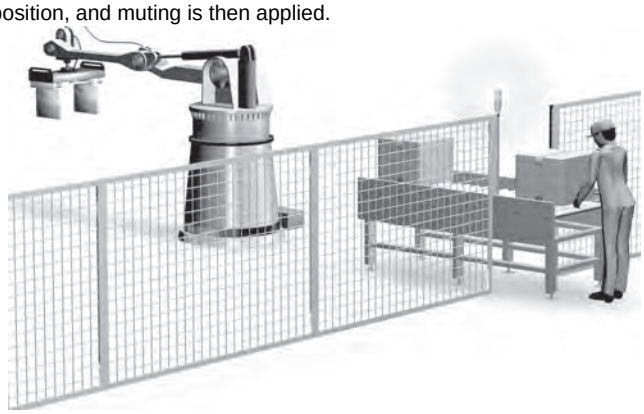
### Partial muting

Partial muting raises safety by muting only the beams of the Safety Light Curtain in the area where the workpiece passes through, while preventing muting in all other areas.



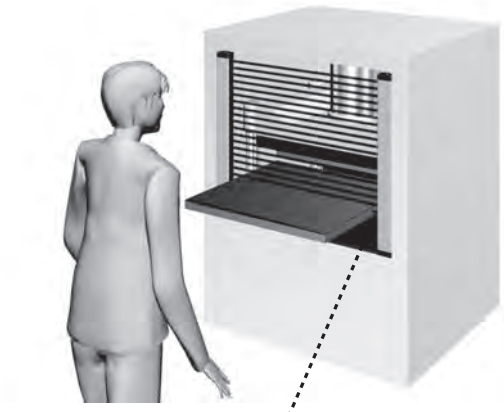

### Position detection muting

This is used in applications where the workpiece is set in position each time by an operator, and then a turntable or positioning robot moves the workpiece to the area where the work is done. A limit switch or other means is used to detect when the robot is in a safe position, and muting is then applied.

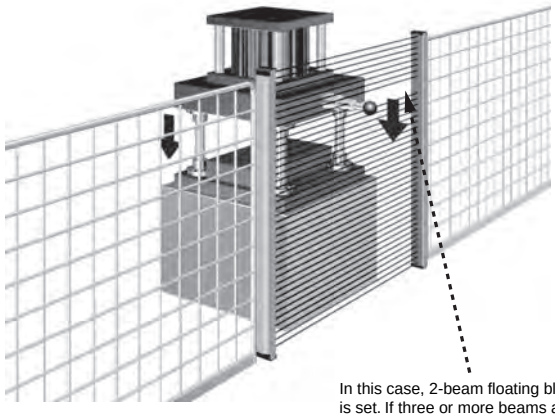


## The blanking function disables specific beams of the Safety Light Curtain.

### Fixed blanking

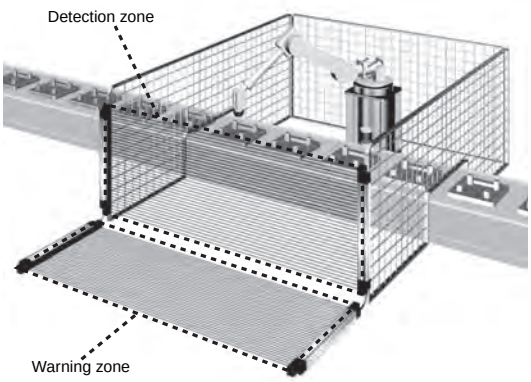



### Floating blanking

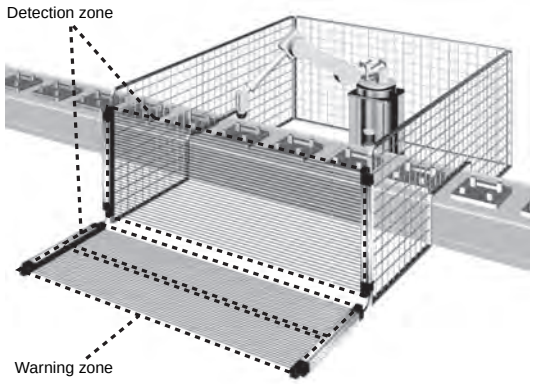



## A warning zone can be set to alert people before they enter a danger zone.

### Dividing the zone between series-connected sensors




### A single sensor can also be divided



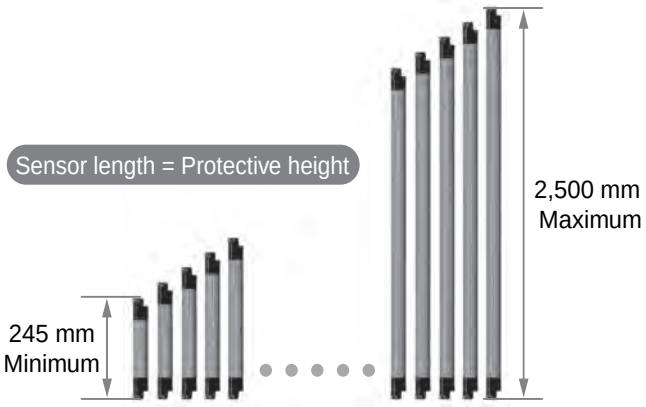
## Selecting a device is as easy as 1-2-3.

The F3SJ Safety Light Curtain is a Type 4 safety sensor that can be used to configure a Category 4 safety circuit.
This means that there is no need to worry about the safety of the resulting circuit. Use the following three easy steps to select the best model for your system design.

### Step 1 Select the required sensor length.

The F3SJ incorporates the "perfect fit" concept that is a feature of OMRON's other Safety Light Curtains. With a line-up of products in 1-beam increments, you can find the sensor that fits your setup perfectly. Refer to the list of sensor models on pages 288, 289 and 290 to select the minimum sensor length required to cover the area you want to protect.

**Note:** We can also manufacture sensors with lengths not included in the list of models. For details, please consult your OMRON sales representative.




### Step 2 Select the output transistor.

Choose the PNP type when installing in safety system configurations that comply with the Machinery Directive or when using with a dedicated controller (F3SP-B1P or F3SX). NPN types are also available as standard products when replacing existing area sensors.

### Step 3 Select the application.

In addition to finger protection, hand protection, and hand/arm protection models, new models have been added that detects a leg or the presence of a person.
For areas where there is only a short distance to the source of danger, select a finger protection model. For areas where there is some distance to the hazardous point and where the machinery stops with sufficient time to spare, choose an economical hand/arm/body protection model.



Finger-protection Detection

Capability: 14 mm diameter (Beam gap: 9 mm)



Hand-protection Detection

Capability: 20 mm diameter (Beam gap: 15 mm)

Capability: 25 mm diameter (Beam gap: 20 mm)



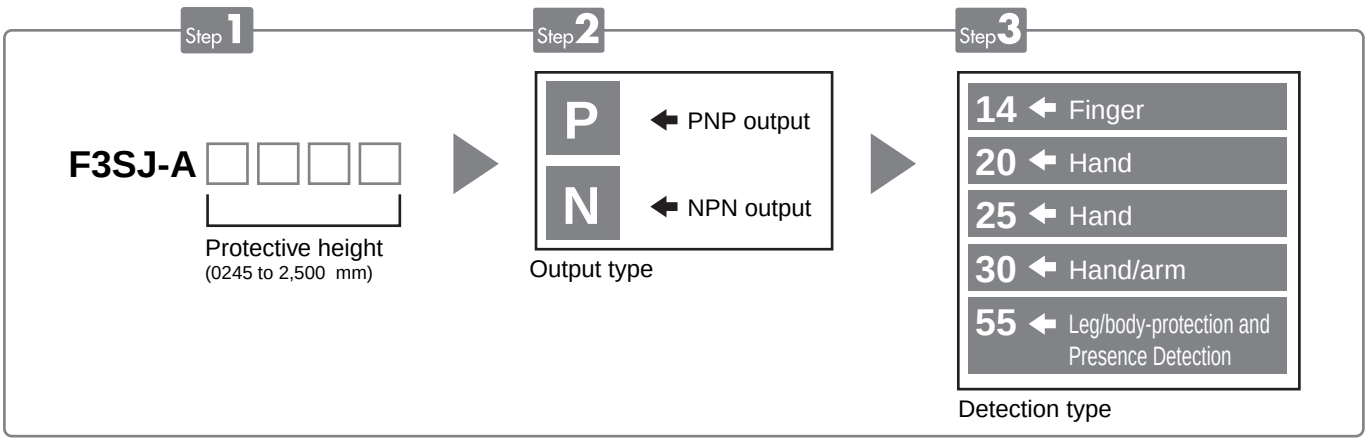
Hand/arm-protection Detection

Capability: 30 mm diameter (Beam gap: 25 mm)



Leg/body-protection and Presence Detection

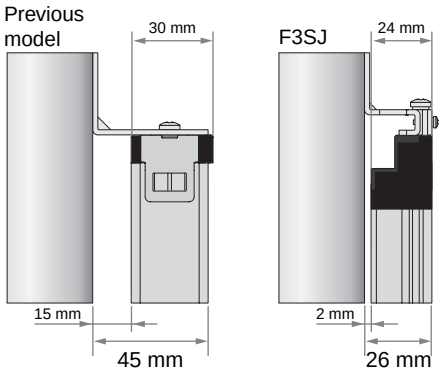
Capability: 55 mm diameter (Beam gap: 50 mm)



# Easier to install, easier to use.

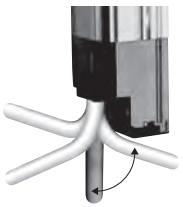
## The thin sensor saves valuable space.

The sensor is 6 mm thinner than our previous models.
When you include the newly designed mounting brackets, which also enable beams to be aligned after the sensor is mounted, the total thickness is 26 mm - a reduction of 19 mm compared to previous models. The low profile means the sensor will not get in the way when adding safety applications to existing equipment.

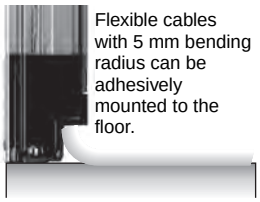



## Flexible cable with a 5 mm bending radius makes wiring a snap.

The F3SJ cables (0.3 m) have M12 connectors and can be routed in any direction. Problems with connector compatibility have been eliminated.



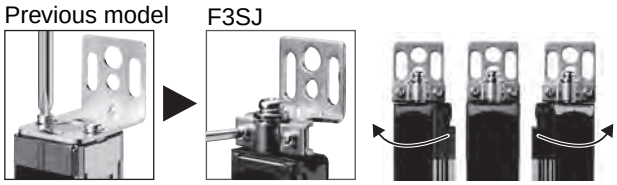
Free-directional cables can be routed down, back, left or right.



Flexible cables with 5 mm bending radius can be adhesively mounted to the floor.

## The included standard mounting brackets are easier than ever to use.

The included mounting brackets, which are suitable for general use, have been redesigned with ease of use in mind.
The new design allows easy screwdriver access, even when mounting in tight spaces. Also, after aligning the beams, screws can be tightened while oriented perpendicular to the lens surface, just like the panel mounting screws.
On previous models, the carefully adjusted beam angles would sometimes come out of alignment when tightening the final screws. This problem has been solved with the F3SJ, because the screw-tightening direction is different from the angle adjustment direction. The result is reduced installation time.

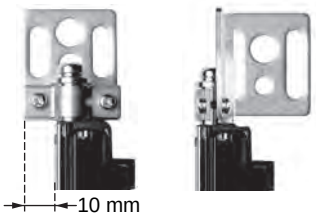



The direction of all screws can be oriented perpendicular to the lens surface. Easy screwdriver access.

The sensor can be rotated along its axis. Beam alignment can be fine-tuned, even when mounted side by side on a surface.

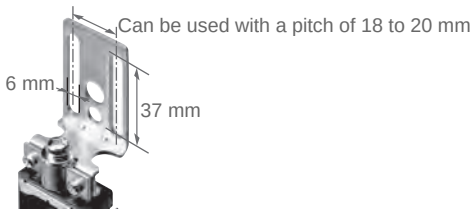
## Side-mounting in tight spaces is simple.

When using standard mounting brackets to mount a sensor on its side, the bracket protrudes outward in front of the lens surface. When this protrusion is of concern, use the F39-LJ2 side-mounting brackets (sold separately).




## Easy to change from previous models.

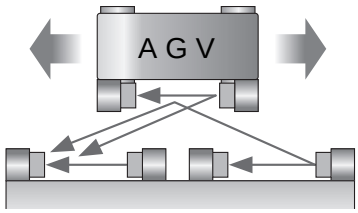
When replacing your previous standard multiple-beam area sensor, use the F39-LJ4 top / bottom mounting bracket B (sold separately), which features enlarged mounting holes.



# A variety of features are provided for easier use.

## Resistant to mutual interference. No wiring between sensors and no interference for up to three sets.

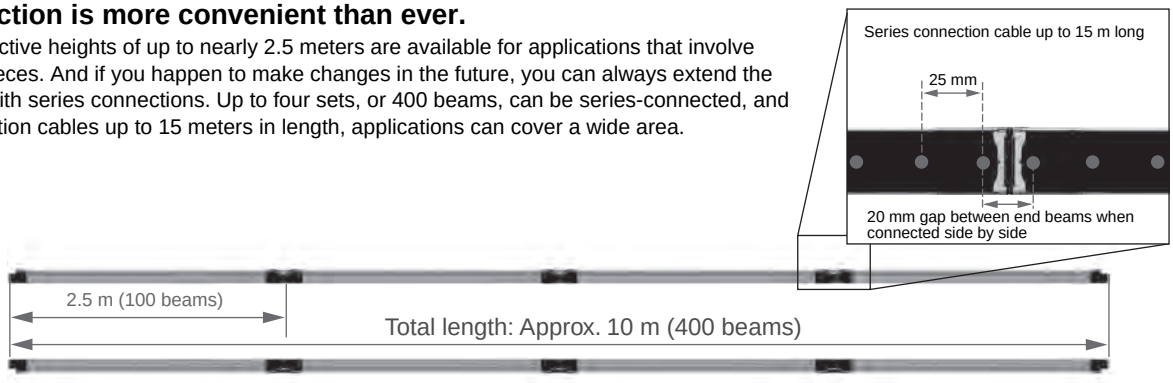
OMRON has developed a unique interference light prevention algorithm that automatically prevents malfunction, even when light is received from three sets.
This feature is ideal for applications where it is not possible to perform wiring with an interference sensor, such as between an AGV and installed equipment.
Also, the Setting Tool can be used to adjust the emitted light intensity to minimize the effect of light on other devices.





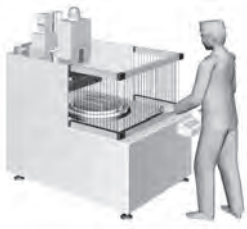

## Maximum protective height of 2,500 mm. Series connection is more convenient than ever.

Sensors with protective heights of up to nearly 2.5 meters are available for applications that involve large-sized workpieces. And if you happen to make changes in the future, you can always extend the protective height with series connections. Up to four sets, or 400 beams, can be series-connected, and with series connection cables up to 15 meters in length, applications can cover a wide area.

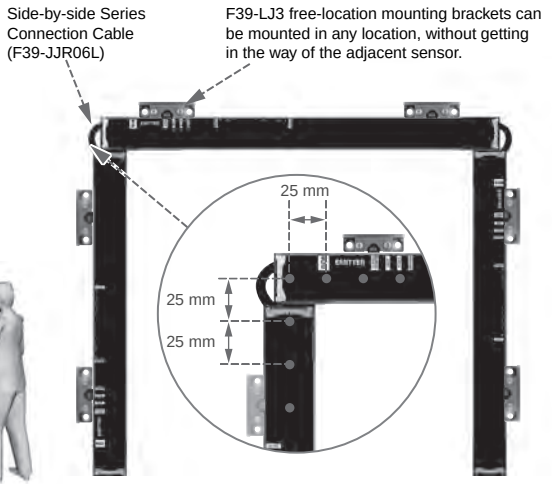



## No bottlenecks in workflow. Free-location brackets make vertical installation easy.

To create "perfect fit" installations with no dead zones or extra space when making series connections in L- or U-shaped configurations, use the F39-LJ3 free-location mounting brackets (sold separately) and F39-JJR06L Side-by-side Series Connection Cable.
In addition to the F39-JJR06L mentioned above, the F39-JJR15L and F39-JJR3W etc. can also be used with series connection cables.



Application example
U-shaped configuration




Keep a 25-mm beam gap in L-shaped installations. The cable (F39-JJR06L) does not get in the way when used in series connections.

# New functions for extra reliability.

## Combine safety and productivity with a controller-less muting function.

The muting function temporarily disables the light curtain when an object must pass through the detection zone, such as when supplying a workpiece to your equipment. In the past, this function required a dedicated muting controller, but now it is built into the F3SJ.
To use the muting function, purchase the F39-CN6 Key Cap for Muting (sold separately). The muting function is enabled simply by replacing the Unit's cap with this Key Cap. In addition, a muting sensor that determines the muting timing, as well as a muting lamp that communicates the muting status to other operators, should be connected to the F3SJ.

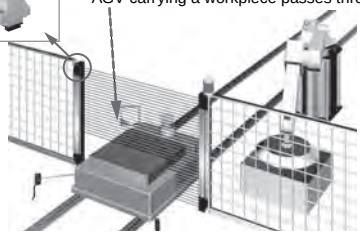
**Built-in muting function**

No controller required. Simply attach the Key Cap (sold separately) to the sensor.

F39-CN6
Key Cap for Muting



The Safety Light Curtain can be disabled when an AGV carrying a workpiece passes through.



## A measure to prevent you from forgetting to connect a series connection cable.

The connectors for series connection feature an intelligent design. To connect a series connection cable to the F3SJ, remove the Key Cap that is required when the sensor is used by itself.
If you should happen to forget to connect the series connection cable, the sensor will not operate by itself without the Key Cap.
This solves the problem of sensors operating independently when a series connection cable is accidentally left unconnected, such as when equipment is moved.

Operates as a single sensor when the Key Cap is attached.



Does not operate without the Key Cap.



## Complies with the latest international safety standards and regulations.

Like previous Type 4 Safety Light Curtains, the F3SJ conforms to the latest required safety standards and regulations. Since the F3SJ also complies with IEC61508, the international standard for functional safety, safety is ensured regardless of where it is used.

| | |
|---|---|
| International standards | IEC61496-1, IEC61496-2, IEC61508 1998 (SIL3) |
| EU legislation EN standards | Machinery Directive, EMC Directive, EN61496-1, prEN61496-2, EN61508 2001 (SIL3) |
| JIS standards | JIS B9704-1, B9704-2 |
| North American standards | UL61496-1, UL61496-2, UL508, UL1998, CAN/CSA22.2 NO.14, CAN/CSA22.2 NO.0.8 |

- Can be used with equipment subject to US OSHA standards (29 CFR 1910.212).
- Satisfies the requirements of the ANSI/RIA R15.06-1999 standards for industrial robots.
- Models are also available which have received S-mark certification from the Korea Occupational Safety and Health Agency (KOSHA). These models have an “-S” at the end of the model number.

CE JIS IEC OSHA ANSI/RIA cUL

# Ordering Information

## Main Units

### Safety Light Curtain F3SJ-A (Type 4)

Infrared light

| Application | Detection capability | Beam gap | Appearance | Operating range | Number of beams | Protective height (mm) | Model | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | PNP Output | NPN Output |
| Finger protection | 14-mm-dia. | 9 mm |  | 0.2 to 9 m | 26 to 180 | 245 to 1,631 | **F3SJ-A□□□□P14 ✻1** | **F3SJ-A□□□□N14** |
| Hand protection | 20-mm-dia. | 15 mm | | 0.2 to 9 m | 16 to 100 | 245 to 1,505 | **F3SJ-A□□□□P20 ✻1** | **F3SJ-A□□□□N20** |
| | | | | 0.2 to 7 m | 110 to 166 | 1,655 to 2,495 | | |
| | | | | 0.2 to 9 m | 16 to 100 | 245 to 1,505 | **F3SJ-A□□□□P20 -TS ✻2** | --- |
| | | | | 0.2 to 7 m | 110 to 166 | 1,655 to 2,495 | | |
| | 25 mm-dia. | 20 mm | | 0.2 to 9 m | 13 to 82 | 260 to 1,640 | **F3SJ-A□□□□P25 ✻1** | **F3SJ-A□□□□N25** |
| | | | | 0.2 to 7 m | 83 to 125 | 1,660 to 2,500 | | |
| | | | | 0.2 to 9 m | 13 to 82 | 260 to 1,640 | **F3SJ-A□□□□P25 -TS ✻2** | --- |
| | | | | 0.2 to 7 m | 83 to 125 | 1,660 to 2,500 | | |
| Hand/arm protection | 30-mm-dia. | 25 mm | | 0.2 to 9 m | 10 to 65 | 245 to 1,620 | **F3SJ-A□□□□P30 ✻1** | **F3SJ-A□□□□N30** |
| | | | | 0.2 to 7 m | 70 to 100 | 1,745 to 2,495 | | |
| Leg/body protection, Presence Detection | 55 mm-dia. | 50 mm | | 0.2 to 9 m | 6 to 33 | 270 to 1,620 | **F3SJ-A□□□□P55 ✻1** | **F3SJ-A□□□□N55** |
| | | | | 0.2 to 7 m | 34 to 50 | 1,670 to 2,470 | | |

**Note:** Connection cables are not included with the products and are to be purchased separately, as needed. You must purchase optional connector cable.

**✻1.** Models with S-mark certification have an "-S" at the end of the model number. Example: F3SJ-A0245P14-S

**✻2.** Models with fixed auto reset (-TS). Parameters cannot be set using the F39-MC21 Setting Console or F39-GWUM "SD Manager" Setting Support Software for F3SJ. See the *Ratings and Performance* data for other differences between this and standard models.

## Safety Light Curtain Model List

Products other than those listed below are also available. Please contact your OMRON sales representative for details.

### F3SJ-A14 Series (9 mm gap)

| Model | | No. of Beams | Protective Height (mm) ✻ |
|---|---|---|---|
| PNP Output | NPN Output | | |
| F3SJ-A0245P14 | F3SJ-A0245N14 | 26 | 245 |
| F3SJ-A0263P14 | F3SJ-A0263N14 | 28 | 263 |
| F3SJ-A0281P14 | F3SJ-A0281N14 | 30 | 281 |
| F3SJ-A0299P14 | F3SJ-A0299N14 | 32 | 299 |
| F3SJ-A0317P14 | F3SJ-A0317N14 | 34 | 317 |
| F3SJ-A0335P14 | F3SJ-A0335N14 | 36 | 335 |
| F3SJ-A0353P14 | F3SJ-A0353N14 | 38 | 353 |
| F3SJ-A0371P14 | F3SJ-A0371N14 | 40 | 371 |
| F3SJ-A0389P14 | F3SJ-A0389N14 | 42 | 389 |
| F3SJ-A0407P14 | F3SJ-A0407N14 | 44 | 407 |
| F3SJ-A0425P14 | F3SJ-A0425N14 | 46 | 425 |
| F3SJ-A0443P14 | F3SJ-A0443N14 | 48 | 443 |
| F3SJ-A0461P14 | F3SJ-A0461N14 | 50 | 461 |
| F3SJ-A0479P14 | F3SJ-A0479N14 | 52 | 479 |
| F3SJ-A0497P14 | F3SJ-A0497N14 | 54 | 497 |
| F3SJ-A0515P14 | F3SJ-A0515N14 | 56 | 515 |
| F3SJ-A0533P14 | F3SJ-A0533N14 | 58 | 533 |
| F3SJ-A0551P14 | F3SJ-A0551N14 | 60 | 551 |
| F3SJ-A0569P14 | F3SJ-A0569N14 | 62 | 569 |
| F3SJ-A0587P14 | F3SJ-A0587N14 | 64 | 587 |

| Model | | No. of Beams | Protective Height (mm) ✻ |
|---|---|---|---|
| PNP Output | NPN Output | | |
| F3SJ-A0605P14 | F3SJ-A0605N14 | 66 | 605 |
| F3SJ-A0623P14 | F3SJ-A0623N14 | 68 | 623 |
| F3SJ-A0659P14 | F3SJ-A0659N14 | 72 | 659 |
| F3SJ-A0695P14 | F3SJ-A0695N14 | 76 | 695 |
| F3SJ-A0731P14 | F3SJ-A0731N14 | 80 | 731 |
| F3SJ-A0767P14 | F3SJ-A0767N14 | 84 | 767 |
| F3SJ-A0803P14 | F3SJ-A0803N14 | 88 | 803 |
| F3SJ-A0839P14 | F3SJ-A0839N14 | 92 | 839 |
| F3SJ-A0875P14 | F3SJ-A0875N14 | 96 | 875 |
| F3SJ-A0911P14 | F3SJ-A0911N14 | 100 | 911 |
| F3SJ-A0983P14 | F3SJ-A0983N14 | 108 | 983 |
| F3SJ-A1055P14 | F3SJ-A1055N14 | 116 | 1055 |
| F3SJ-A1127P14 | F3SJ-A1127N14 | 124 | 1127 |
| F3SJ-A1199P14 | F3SJ-A1199N14 | 132 | 1199 |
| F3SJ-A1271P14 | F3SJ-A1271N14 | 140 | 1271 |
| F3SJ-A1343P14 | F3SJ-A1343N14 | 148 | 1343 |
| F3SJ-A1415P14 | F3SJ-A1415N14 | 156 | 1415 |
| F3SJ-A1487P14 | F3SJ-A1487N14 | 164 | 1487 |
| F3SJ-A1559P14 | F3SJ-A1559N14 | 172 | 1559 |
| F3SJ-A1631P14 | F3SJ-A1631N14 | 180 | 1631 |

✻ Protective Height (mm) = Total sensor length

## F3SJ-A20 Series (15-mm gap), F3SJ-A20-TS Series (15-mm gap) ∗1

| Model | | No. of Beams | Protective Height (mm) ∗2 |
|---|---|---|---|
| PNP Output ∗1 | NPN Output | | |
| F3SJ-A0245P20 | F3SJ-A0245N20 | 16 | 245 |
| F3SJ-A0275P20 | F3SJ-A0275N20 | 18 | 275 |
| F3SJ-A0305P20 | F3SJ-A0305N20 | 20 | 305 |
| F3SJ-A0335P20 | F3SJ-A0335N20 | 22 | 335 |
| F3SJ-A0365P20 | F3SJ-A0365N20 | 24 | 365 |
| F3SJ-A0395P20 | F3SJ-A0395N20 | 26 | 395 |
| F3SJ-A0425P20 | F3SJ-A0425N20 | 28 | 425 |
| F3SJ-A0455P20 | F3SJ-A0455N20 | 30 | 455 |
| F3SJ-A0485P20 | F3SJ-A0485N20 | 32 | 485 |
| F3SJ-A0515P20 | F3SJ-A0515N20 | 34 | 515 |
| F3SJ-A0545P20 | F3SJ-A0545N20 | 36 | 545 |
| F3SJ-A0575P20 | F3SJ-A0575N20 | 38 | 575 |
| F3SJ-A0605P20 | F3SJ-A0605N20 | 40 | 605 |
| F3SJ-A0635P20 | F3SJ-A0635N20 | 42 | 635 |
| F3SJ-A0665P20 | F3SJ-A0665N20 | 44 | 665 |
| F3SJ-A0695P20 | F3SJ-A0695N20 | 46 | 695 |
| F3SJ-A0725P20 | F3SJ-A0725N20 | 48 | 725 |
| F3SJ-A0755P20 | F3SJ-A0755N20 | 50 | 755 |
| F3SJ-A0785P20 | F3SJ-A0785N20 | 52 | 785 |
| F3SJ-A0815P20 | F3SJ-A0815N20 | 54 | 815 |
| F3SJ-A0845P20 | F3SJ-A0845N20 | 56 | 845 |
| F3SJ-A0875P20 | F3SJ-A0875N20 | 58 | 875 |
| F3SJ-A0905P20 | F3SJ-A0905N20 | 60 | 905 |
| F3SJ-A0935P20 | F3SJ-A0935N20 | 62 | 935 |
| F3SJ-A0965P20 | F3SJ-A0965N20 | 64 | 965 |
| F3SJ-A0995P20 | F3SJ-A0995N20 | 66 | 995 |
| F3SJ-A1025P20 | F3SJ-A1025N20 | 68 | 1025 |
| F3SJ-A1055P20 | F3SJ-A1055N20 | 70 | 1055 |
| F3SJ-A1085P20 | F3SJ-A1085N20 | 72 | 1085 |
| F3SJ-A1115P20 | F3SJ-A1115N20 | 74 | 1115 |
| F3SJ-A1145P20 | F3SJ-A1145N20 | 76 | 1145 |
| F3SJ-A1175P20 | F3SJ-A1175N20 | 78 | 1175 |
| F3SJ-A1205P20 | F3SJ-A1205N20 | 80 | 1205 |
| F3SJ-A1235P20 | F3SJ-A1235N20 | 82 | 1235 |
| F3SJ-A1265P20 | F3SJ-A1265N20 | 84 | 1265 |
| F3SJ-A1325P20 | F3SJ-A1325N20 | 88 | 1325 |
| F3SJ-A1385P20 | F3SJ-A1385N20 | 92 | 1385 |
| F3SJ-A1445P20 | F3SJ-A1445N20 | 96 | 1445 |
| F3SJ-A1505P20 | F3SJ-A1505N20 | 100 | 1505 |
| F3SJ-A1655P20 | F3SJ-A1655N20 | 110 | 1655 |
| F3SJ-A1805P20 | F3SJ-A1805N20 | 120 | 1805 |
| F3SJ-A1955P20 | F3SJ-A1955N20 | 130 | 1955 |
| F3SJ-A2105P20 | F3SJ-A2105N20 | 140 | 2105 |
| F3SJ-A2255P20 | F3SJ-A2255N20 | 150 | 2255 |
| F3SJ-A2405P20 | F3SJ-A2405N20 | 160 | 2405 |
| F3SJ-A2495P20 | F3SJ-A2495N20 | 166 | 2495 |

**∗1.** The suffix "-TS" is attached to the model number of models with fixed auto reset. (Only for PNP output)
**∗2.** Protective Height (mm) = Total sensor length

## F3SJ-A25 Series (20-mm gap), F3SJ-A25-TS Series (20-mm gap) ∗1

| Model | | No. of Beams | Protective Height (mm) ∗2 |
|---|---|---|---|
| PNP output ∗1 | NPN Output | | |
| F3SJ-A0260P25 | F3SJ-A0260N25 | 13 | 260 |
| F3SJ-A0300P25 | F3SJ-A0300N25 | 15 | 300 |
| F3SJ-A0340P25 | F3SJ-A0340N25 | 17 | 340 |
| F3SJ-A0380P25 | F3SJ-A0380N25 | 19 | 380 |
| F3SJ-A0420P25 | F3SJ-A0420N25 | 21 | 420 |
| F3SJ-A0460P25 | F3SJ-A0460N25 | 23 | 460 |
| F3SJ-A0500P25 | F3SJ-A0500N25 | 25 | 500 |
| F3SJ-A0540P25 | F3SJ-A0540N25 | 27 | 540 |
| F3SJ-A0580P25 | F3SJ-A0580N25 | 29 | 580 |
| F3SJ-A0620P25 | F3SJ-A0620N25 | 31 | 620 |
| F3SJ-A0660P25 | F3SJ-A0660N25 | 33 | 660 |
| F3SJ-A0700P25 | F3SJ-A0700N25 | 35 | 700 |
| F3SJ-A0740P25 | F3SJ-A0740N25 | 37 | 740 |
| F3SJ-A0780P25 | F3SJ-A0780N25 | 39 | 780 |
| F3SJ-A0820P25 | F3SJ-A0820N25 | 41 | 820 |
| F3SJ-A0860P25 | F3SJ-A0860N25 | 43 | 860 |
| F3SJ-A0900P25 | F3SJ-A0900N25 | 45 | 900 |
| F3SJ-A0940P25 | F3SJ-A0940N25 | 47 | 940 |
| F3SJ-A0980P25 | F3SJ-A0980N25 | 49 | 980 |
| F3SJ-A1020P25 | F3SJ-A1020N25 | 51 | 1020 |
| F3SJ-A1060P25 | F3SJ-A1060N25 | 53 | 1060 |
| F3SJ-A1100P25 | F3SJ-A1100N25 | 55 | 1100 |
| F3SJ-A1140P25 | F3SJ-A1140N25 | 57 | 1140 |
| F3SJ-A1180P25 | F3SJ-A1180N25 | 59 | 1180 |
| F3SJ-A1220P25 | F3SJ-A1220N25 | 61 | 1220 |
| F3SJ-A1260P25 | F3SJ-A1260N25 | 63 | 1260 |
| F3SJ-A1300P25 | F3SJ-A1300N25 | 65 | 1300 |
| F3SJ-A1340P25 | F3SJ-A1340N25 | 67 | 1340 |
| F3SJ-A1380P25 | F3SJ-A1380N25 | 69 | 1380 |
| F3SJ-A1420P25 | F3SJ-A1420N25 | 71 | 1420 |
| F3SJ-A1460P25 | F3SJ-A1460N25 | 73 | 1460 |
| F3SJ-A1500P25 | F3SJ-A1500N25 | 75 | 1500 |
| F3SJ-A1540P25 | F3SJ-A1540N25 | 77 | 1540 |
| F3SJ-A1580P25 | F3SJ-A1580N25 | 79 | 1580 |
| F3SJ-A1620P25 | F3SJ-A1620N25 | 81 | 1620 |
| F3SJ-A1660P25 | F3SJ-A1660N25 | 83 | 1660 |
| F3SJ-A1700P25 | F3SJ-A1700N25 | 85 | 1700 |
| F3SJ-A1740P25 | F3SJ-A1740N25 | 87 | 1740 |
| F3SJ-A1780P25 | F3SJ-A1780N25 | 89 | 1780 |
| F3SJ-A1820P25 | F3SJ-A1820N25 | 91 | 1820 |
| F3SJ-A1860P25 | F3SJ-A1860N25 | 93 | 1860 |
| F3SJ-A1900P25 | F3SJ-A1900N25 | 95 | 1900 |
| F3SJ-A1940P25 | F3SJ-A1940N25 | 97 | 1940 |
| F3SJ-A1980P25 | F3SJ-A1980N25 | 99 | 1980 |
| F3SJ-A2020P25 | F3SJ-A2020N25 | 101 | 2020 |
| F3SJ-A2060P25 | F3SJ-A2060N25 | 103 | 2060 |
| F3SJ-A2100P25 | F3SJ-A2100N25 | 105 | 2100 |
| F3SJ-A2140P25 | F3SJ-A2140N25 | 107 | 2140 |
| F3SJ-A2180P25 | F3SJ-A2180N25 | 109 | 2180 |
| F3SJ-A2220P25 | F3SJ-A2220N25 | 111 | 2220 |
| F3SJ-A2260P25 | F3SJ-A2260N25 | 113 | 2260 |
| F3SJ-A2300P25 | F3SJ-A2300N25 | 115 | 2300 |
| F3SJ-A2340P25 | F3SJ-A2340N25 | 117 | 2340 |
| F3SJ-A2380P25 | F3SJ-A2380N25 | 119 | 2380 |
| F3SJ-A2420P25 | F3SJ-A2420N25 | 121 | 2420 |
| F3SJ-A2460P25 | F3SJ-A2460N25 | 123 | 2460 |
| F3SJ-A2500P25 | F3SJ-A2500N25 | 125 | 2500 |

**∗1.** The suffix "-TS" is attached to the model number of models with fixed auto reset. (Only for PNP output)
**∗2.** Protective Height (mm)= Total sensor length

## F3SJ-A30 Series (25-mm gap)

| Model | | No. of Beams | Protective Height (mm) ✻ |
|---|---|---|---|
| PNP Output | NPN Output | | |
| F3SJ-A0245P30 | F3SJ-A0245N30 | 10 | 245 |
| F3SJ-A0270P30 | F3SJ-A0270N30 | 11 | 270 |
| F3SJ-A0295P30 | F3SJ-A0295N30 | 12 | 295 |
| F3SJ-A0320P30 | F3SJ-A0320N30 | 13 | 320 |
| F3SJ-A0345P30 | F3SJ-A0345N30 | 14 | 345 |
| F3SJ-A0370P30 | F3SJ-A0370N30 | 15 | 370 |
| F3SJ-A0395P30 | F3SJ-A0395N30 | 16 | 395 |
| F3SJ-A0420P30 | F3SJ-A0420N30 | 17 | 420 |
| F3SJ-A0445P30 | F3SJ-A0445N30 | 18 | 445 |
| F3SJ-A0470P30 | F3SJ-A0470N30 | 19 | 470 |
| F3SJ-A0495P30 | F3SJ-A0495N30 | 20 | 495 |
| F3SJ-A0520P30 | F3SJ-A0520N30 | 21 | 520 |
| F3SJ-A0545P30 | F3SJ-A0545N30 | 22 | 545 |
| F3SJ-A0570P30 | F3SJ-A0570N30 | 23 | 570 |
| F3SJ-A0595P30 | F3SJ-A0595N30 | 24 | 595 |
| F3SJ-A0620P30 | F3SJ-A0620N30 | 25 | 620 |
| F3SJ-A0645P30 | F3SJ-A0645N30 | 26 | 645 |
| F3SJ-A0670P30 | F3SJ-A0670N30 | 27 | 670 |
| F3SJ-A0695P30 | F3SJ-A0695N30 | 28 | 695 |
| F3SJ-A0720P30 | F3SJ-A0720N30 | 29 | 720 |
| F3SJ-A0745P30 | F3SJ-A0745N30 | 30 | 745 |
| F3SJ-A0770P30 | F3SJ-A0770N30 | 31 | 770 |
| F3SJ-A0795P30 | F3SJ-A0795N30 | 32 | 795 |
| F3SJ-A0820P30 | F3SJ-A0820N30 | 33 | 820 |
| F3SJ-A0845P30 | F3SJ-A0845N30 | 34 | 845 |
| F3SJ-A0870P30 | F3SJ-A0870N30 | 35 | 870 |
| F3SJ-A0895P30 | F3SJ-A0895N30 | 36 | 895 |
| F3SJ-A0920P30 | F3SJ-A0920N30 | 37 | 920 |
| F3SJ-A0945P30 | F3SJ-A0945N30 | 38 | 945 |
| F3SJ-A0970P30 | F3SJ-A0970N30 | 39 | 970 |
| F3SJ-A0995P30 | F3SJ-A0995N30 | 40 | 995 |
| F3SJ-A1020P30 | F3SJ-A1020N30 | 41 | 1020 |
| F3SJ-A1045P30 | F3SJ-A1045N30 | 42 | 1045 |
| F3SJ-A1070P30 | F3SJ-A1070N30 | 43 | 1070 |
| F3SJ-A1095P30 | F3SJ-A1095N30 | 44 | 1095 |
| F3SJ-A1120P30 | F3SJ-A1120N30 | 45 | 1120 |
| F3SJ-A1145P30 | F3SJ-A1145N30 | 46 | 1145 |
| F3SJ-A1170P30 | F3SJ-A1170N30 | 47 | 1170 |
| F3SJ-A1195P30 | F3SJ-A1195N30 | 48 | 1195 |
| F3SJ-A1220P30 | F3SJ-A1220N30 | 49 | 1220 |
| F3SJ-A1245P30 | F3SJ-A1245N30 | 50 | 1245 |
| F3SJ-A1270P30 | F3SJ-A1270N30 | 51 | 1270 |
| F3SJ-A1295P30 | F3SJ-A1295N30 | 52 | 1295 |
| F3SJ-A1395P30 | F3SJ-A1395N30 | 56 | 1395 |
| F3SJ-A1495P30 | F3SJ-A1495N30 | 60 | 1495 |
| F3SJ-A1620P30 | F3SJ-A1620N30 | 65 | 1620 |
| F3SJ-A1745P30 | F3SJ-A1745N30 | 70 | 1745 |
| F3SJ-A1870P30 | F3SJ-A1870N30 | 75 | 1870 |
| F3SJ-A1995P30 | F3SJ-A1995N30 | 80 | 1995 |
| F3SJ-A2120P30 | F3SJ-A2120N30 | 85 | 2120 |
| F3SJ-A2245P30 | F3SJ-A2245N30 | 90 | 2245 |
| F3SJ-A2370P30 | F3SJ-A2370N30 | 95 | 2370 |
| F3SJ-A2495P30 | F3SJ-A2495N30 | 100 | 2495 |

✻ Protective Height (mm)= Total sensor length

## F3SJ-A55 Series (50-mm gap)

| Model | | No. of Beams | Protective Height (mm) ✻ |
|---|---|---|---|
| PNP Output | NPN Output | | |
| F3SJ-A0270P55 | F3SJ-A0270N55 | 6 | 270 |
| F3SJ-A0320P55 | F3SJ-A0320N55 | 7 | 320 |
| F3SJ-A0370P55 | F3SJ-A0370N55 | 8 | 370 |
| F3SJ-A0420P55 | F3SJ-A0420N55 | 9 | 420 |
| F3SJ-A0470P55 | F3SJ-A0470N55 | 10 | 470 |
| F3SJ-A0520P55 | F3SJ-A0520N55 | 11 | 520 |
| F3SJ-A0570P55 | F3SJ-A0570N55 | 12 | 570 |
| F3SJ-A0620P55 | F3SJ-A0620N55 | 13 | 620 |
| F3SJ-A0670P55 | F3SJ-A0670N55 | 14 | 670 |
| F3SJ-A0720P55 | F3SJ-A0720N55 | 15 | 720 |
| F3SJ-A0770P55 | F3SJ-A0770N55 | 16 | 770 |
| F3SJ-A0820P55 | F3SJ-A0820N55 | 17 | 820 |
| F3SJ-A0870P55 | F3SJ-A0870N55 | 18 | 870 |
| F3SJ-A0920P55 | F3SJ-A0920N55 | 19 | 920 |
| F3SJ-A0970P55 | F3SJ-A0970N55 | 20 | 970 |
| F3SJ-A1020P55 | F3SJ-A1020N55 | 21 | 1020 |
| F3SJ-A1070P55 | F3SJ-A1070N55 | 22 | 1070 |
| F3SJ-A1120P55 | F3SJ-A1120N55 | 23 | 1120 |
| F3SJ-A1170P55 | F3SJ-A1170N55 | 24 | 1170 |
| F3SJ-A1220P55 | F3SJ-A1220N55 | 25 | 1220 |
| F3SJ-A1270P55 | F3SJ-A1270N55 | 26 | 1270 |
| F3SJ-A1320P55 | F3SJ-A1320N55 | 27 | 1320 |
| F3SJ-A1370P55 | F3SJ-A1370N55 | 28 | 1370 |
| F3SJ-A1420P55 | F3SJ-A1420N55 | 29 | 1420 |
| F3SJ-A1470P55 | F3SJ-A1470N55 | 30 | 1470 |
| F3SJ-A1520P55 | F3SJ-A1520N55 | 31 | 1520 |
| F3SJ-A1570P55 | F3SJ-A1570N55 | 32 | 1570 |
| F3SJ-A1620P55 | F3SJ-A1620N55 | 33 | 1620 |
| F3SJ-A1670P55 | F3SJ-A1670N55 | 34 | 1670 |
| F3SJ-A1720P55 | F3SJ-A1720N55 | 35 | 1720 |
| F3SJ-A1770P55 | F3SJ-A1770N55 | 36 | 1770 |
| F3SJ-A1820P55 | F3SJ-A1820N55 | 37 | 1820 |
| F3SJ-A1870P55 | F3SJ-A1870N55 | 38 | 1870 |
| F3SJ-A1920P55 | F3SJ-A1920N55 | 39 | 1920 |
| F3SJ-A1970P55 | F3SJ-A1970N55 | 40 | 1970 |
| F3SJ-A2020P55 | F3SJ-A2020N55 | 41 | 2020 |
| F3SJ-A2070P55 | F3SJ-A2070N55 | 42 | 2070 |
| F3SJ-A2120P55 | F3SJ-A2120N55 | 43 | 2120 |
| F3SJ-A2170P55 | F3SJ-A2170N55 | 44 | 2170 |
| F3SJ-A2220P55 | F3SJ-A2220N55 | 45 | 2220 |
| F3SJ-A2270P55 | F3SJ-A2270N55 | 46 | 2270 |
| F3SJ-A2320P55 | F3SJ-A2320N55 | 47 | 2320 |
| F3SJ-A2370P55 | F3SJ-A2370N55 | 48 | 2370 |
| F3SJ-A2420P55 | F3SJ-A2420N55 | 49 | 2420 |
| F3SJ-A2470P55 | F3SJ-A2470N55 | 50 | 2470 |

✻ Protective Height (mm)= Total sensor length

## Accessories (Optional)

### Single-end Connector Cable (2 cables per set, for emitter and receiver)

For wiring with safety circuit such as single safety relay, safety relay unit, and safety controller

| Appearance | Cable length | Specifications | Model |
|---|---|---|---|
|  | 0.5 m | M12 connector (8-pin) | **F39-JCR5A** |
| | 3 m | | **F39-JC3A** |
| | 7 m | | **F39-JC7A** |
| | 10 m | | **F39-JC10A** |
| | 15 m | | **F39-JC15A** |
| | 20 m | | **F39-JC20A** |

### Double-end Connector Cable (2 cables per set, for emitter and receiver)

For connection with F3SP-B1P control unit, and for extension when series-connected ✻

| Appearance | Cable length | Specifications | Model |
|---|---|---|---|
|  | 0.5 m | M12 connector (8-pin) | **F39-JCR5B** |
| | 1 m | | **F39-JC1B** |
| | 3 m | | **F39-JC3B** |
| | 5 m | | **F39-JC5B** |
| | 7 m | | **F39-JC7B** |
| | 10 m | | **F39-JC10B** |
| | 15 m | | **F39-JC15B** |
| | 20 m | | **F39-JC20B** |
| | 30 m | | **F39-JC30B** |
| | 40 m | | **F39-JC40B** |

✻ To extend the cable length under series connection, use F39-JJR3W and F39-JC□B in combination. Also, the cable length 20 to 40 m cannot be used.

### Power Cable (Included with the main unit) (2 cables per set, for emitter and receiver)

| Appearance | Cable length | Model |
|---|---|---|
|  | 0.3 m | **F39-JJR3K** |

### Series Connection Cable (2 cables per set, for emitter and receiver)

| Type | Appearance | Cable length | Model | Application |
|---|---|---|---|---|
| Series connection cable |  | 0.3 m | **F39-JJR3W** | For series connection ✻1 When using the Water-resistant Case. ✻2 |
| Extension cable |  | 0.5 to 15 m | **F39-JC□B** | To change series connection length in combination with F39-JJR3W |
| Side-by-side Series connection cable |  | 0.06 m | **F39-JJR06L** | Dedicated series connection cable with minimum length, used in place of the sensor's cable with connector |
| | | 0.15 m | **F39-JJR15L** | |

✻1. Total cable length of series connection is 0.6 m to connect to connector cable of the main sensor unit. For series connection with minimum length, use the F39-JJR06L or F39-JJR15L.

✻2. When using the F39-EJ□□□□-L/D Water-resistant Case in series connection configurations, use the special series connection cables for the Water-resistant Case. Refer to page 295 for details.

## Relays with Forcibly Guided Contacts

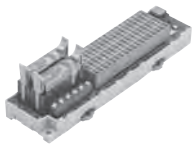
| Type | Appearance | Specifications | Model | Remarks |
|---|---|---|---|---|
| G7SA Relays with Forcibly Guided Contacts |  | • No. of contacts: 4<br>• Contact type: 2NO+2NC<br>• Rated switch load: 250 VAC 6 A, 30 VDC 6 A | **G7SA-2A2B** | For other models and functions, refer to G7SA on page 538 and Socket models. |
| | | • No. of contacts: 4<br>• Contact type: 3NO+1NC<br>• Rated switch load: 250 VAC 6 A, 30 VDC 6 A | **G7SA-3A1B** | |
| G7S□-E Relays with Forcibly Guided Contacts |  | • No. of contacts: 6<br>• Contact type: 4NO+2NC<br>• Rated switch load: 250 VAC 10 A, 30 VDC 10 A | **G7S-4A2B-E** | For other models and functions, refer to G7S□-E on page 554 and Socket models. |
| | | • No. of contacts: 6<br>• Contact type: 3NO+3NC<br>• Rated switch load: 250 VAC 10 A, 30 VDC 10 A | **G7S-3A3B-E** | |

## Control unit (Can not be used as a muting system) (Dedicated PNP output type) ✻

| Appearance | Output | Model | Remarks |
|---|---|---|---|
|  | Relay, 3NO+1NC | **F3SP-B1P ✻** | For connection with F3SJ-A, use an F39-JC□B double-end connector cable |

✻ F3SJ for NPN output type cannot be connected.

## Wire-saving Devices

| Type | Appearance | Specifications | Model | Remarks |
|---|---|---|---|---|
| Connector Terminal Box/Muting Terminals ✻1 |  | Model with PNP Muting Sensor Output | **F39-TC5P01** | Significantly reduces amount of wiring between Safety Light Curtains and Muting Sensors<br>IP67 model for mounting at Sensor installation site<br>Refer to F39-TC5 on page 360 |
| | | Model with PNP Override Input | **F39-TC5P02** | |
| | | Model with NPN Muting Sensor Output | **F39-TC5N01** | |
| | | Model with NPN Override Input | **F39-TC5N02** | |
| Safety Terminal Relays ✻2 |  | PNP output relay, SPDT-NO | **F3SP-T01** | Significantly reduces amount of wiring between Safety Light Curtains and Muting Sensors<br>Refer to F3SP-T01 on page 368 |

**✻1.** For the F3SJ-A.
**✻2.** For the F3SJ-A□P□.

OMRON offers many Safety Application Controllers to help you build safety circuits.
Refer to page 568 for available models. Refer to page 574 for specifications.

## Dedicated External Indicator Set (Can be connected to either an emitter or a receiver)

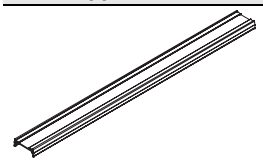
| Appearance | Color | Model | Remarks |
|---|---|---|---|
|  | Red | **F39-A01PR-PAC** | Indicator (red), mounting bracket (1 set), and dedicated connection cable (0.1 m) |
| | Green | **F39-A01PG-PAC** | Indicator (green), mounting bracket (1 set), and dedicated connection cable (0.1 m) |
| | Yellow | **F39-A01PY-PAC** | Indicator (yellow), mounting bracket (1 set), and dedicated connection cable (0.1 m) |

**Note:** For indication timing (operation mode) see *"Specifications"* on page 296.

## General External Indicator Cable

| Appearance | Cable length | Specifications | Model |
|---|---|---|---|
|  | 3 m | Cable to connect top of the main unit and an off-the shelf external indicator (2-wire) | **F39-JJ3N** |

## Spatter Protection Cover (Includes two pieces for emitter and receiver) (Each unit reduces the operating range by 10%)

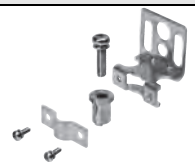
| Appearance | Applicable sensor | Model |
|---|---|---|
|  | F3SJ-A series | **F39-HJ□□□□** ✻ |

✻ The same 4-digit numbers as the protective heights (□□□□ in the light curtain type names) are substituted by □□□□ in the model names.

### Mirrors (12% Sensing Distance Attenuation)

| Mirror material | Width (mm) | Thickness (mm) | Length (mm) | Model |
|---|---|---|---|---|
| Glass mirror | 145 | 32 | 406 | **F39-MLG0406** |
| | | | 610 | **F39-MLG0610** |
| | | | 711 | **F39-MLG0711** |
| | | | 914 | **F39-MLG0914** |
| | | | 1,067 | **F39-MLG1067** |
| | | | 1,219 | **F39-MLG1219** |
| | | | 1,422 | **F39-MLG1422** |
| | | | 1,626 | **F39-MLG1626** |
| | | | 1,830 | **F39-MLG1830** |
| | | | 2,134 | **F39-MLG2134** |

## Sensor Mounting Bracket (Sold separately)

| Appearance | Specifications | Model | Application | Remarks |
|---|---|---|---|---|
|  | Standard mounting bracket (for top/bottom) | **F39-LJ1** | (included in the main unit) | 2 for emitter,<br>2 for receiver<br>(total of 4 per set) |
|  | Flat side mounting bracket | **F39-LJ2** | Use these small-sized brackets when performing side mounting with standard mounting brackets, so that they do not protrude from the detection surface. | 2 for emitter,<br>2 for receiver<br>(total of 4 per set) |
|  | Free-location mounting bracket (also used as standard intermediate bracket) | **F39-LJ3** | Use these brackets for mounting on any place without using standard bracket. | 1 set with 2 pieces<br>(For details about the number of required brackets, refer to page 320.) |
|  | F3SN Intermediate Bracket Replacement Spacers | **F39-LJ3-SN** | When replacing the F3SN with the F3SJ, the mounting hole pitches in the Intermediate Brackets are not the same. This Spacer is placed between the mounting holes to mount the F3SJ. | 1 set with 2 pieces |
|  | Top/bottom mounting bracket B (mounting hole pitch 19 mm) | **F39-LJ4** | Mounting bracket used when replacing existing area sensors (other than F3SN or F3WN) with the F3SJ.<br>For front mounting.<br>Suitable for mounting hole pitch of 18 to 20 mm. | 2 for emitter,<br>2 for receiver<br>(total of 4 per set) |
|  | Bracket for replacing short-length F3SN | **F39-LJ5** | Mounting bracket used when an F3SN with protective height of 300 mm or less is replaced by an F3SJ. | 2 for emitter,<br>2 for receiver<br>(total of 4 per set) |
|  | Space-saving mounting bracket | **F39-LJ8** | Use these brackets to mount facing inward.<br>Length is 12 mm shorter than the standard F39-LJ1 bracket. | 2 for emitter,<br>2 for receiver<br>(total of 4 per set) |
|  | Mounting bracket used when replacing an F3W-C. | **F39-LJ9** | Mounting bracket used when replacing existing F3W-C series area sensors with the F3SJ.<br>For front mounting or side mounting.<br>Mounting hole pitch 16 mm. | 2 for emitter,<br>2 for receiver<br>(total of 4 per set) |
|  | Top/bottom mounting bracket C (mounting hole pitch 13 mm) | **F39-LJ11** | Mounting bracket used when replacing existing area sensors having a mounting pitch of 13 mm with the F3SJ. | 2 for emitter,<br>2 for receiver<br>(total of 4 per set) |

## Key cap for muting

| Appearance | Model | Remarks |
|---|---|---|
|  | **F39-CN6** | Cap attaches to the main unit to enable muting function.<br>Attach it to either an emitter or a receiver. (Case: orange) |

## Setting Tools ∗1

| Type | Appearance | Model | Remarks |
|---|---|---|---|
| "SD Manager" Setting Support Software for the F3SJ |  | **F39-GWUM** | Accessories: SD Manager CD-ROM (1), F39-CN1 Branch Connector (1), Connector Cap (1), 2-m Dedicated Cable (1), 0.3-m Dedicated Cable with Plug (1), Instruction Manual |
| Setting Console |  | **F39-MC21 ∗2** | Accessories: F39-CN1 Branch Connector (1), Connector Cap (1), 2-m Dedicated Cable (1), 0.3-m Dedicated Cable with Plug (1), Instruction Manual |

**∗1.** The setting tools described above can be connected only to F3SJ-A models with built-in software of Ver. 2 or later.
Note that the setting tools cannot be used with products shipped prior to December 2005. The setting tools cannot be used for setting parameters on the F3SJ-A□-TS series, but the monitoring function can be used.
**∗2.** This product is for use only with the F3SJ-A. It cannot be connected to conventional models of the F3SN-A series.
Similarly, the F39-MC11 and F39-MT11 Dedicated Consoles for the F3SN-A cannot be connected to the F3SJ-A series.

## Protective Bar (Main unit mounting bracket (1) and a rear mounting bracket set) ∗1

| Type | Appearance | Model | Remarks |
|---|---|---|---|
| Protective Bar Set |  | **F39-PJ□□□□-S ∗2** | Rear Mounting Brackets (2), including intermediate brackets to match protective height (0 to 2). |
| Intermediate brackets for side mounting |  | **F39-PJ-MS** | For side mounting, order to suit the desired protective height.<br>Protective height of up to 1,000 mm: 0 intermediate brackets<br>Protective height of 1,001 to 2,000 mm: 1 intermediate bracket<br>Protective height of 2,001 mm or more: 2 intermediate brackets |

**∗1.** When using for both emitter and receiver, order two sets.
**∗2.** The same four digits indicating protective height that are used in the Sensor model number (□□□□) are used in the □□□□ part of the Protector model number.

## Water-resistant Case (Set of 1 tube, packing, and dedicated connector cable) ∗1 ∗2

| Appearance | Specifications | Model | Remarks |
|---|---|---|---|
|  | For emitter | **F39-EJ□□□□-L ∗3** | Includes gray cable for emitter. |
| | For receiver | **F39-EJ□□□□-D ∗3** | Includes black cable for receiver. |
|  | Rear Mounting Brackets | **F39-EJ-R ∗4** | Top/bottom 1 each, total of 2 |
|  | Side Mounting Brackets | **F39-EJ-S ∗4** | Top/bottom 1 each, total of 2 |
| --- | Series connection cable (for emitter) | **F39-JJR3WE-L** | Purchase additionally for series connection when using the Water-resistant Case. |
| | Series connection cable (for receiver) | **F39-JJR3WE-D** | |

**∗1.** When using for both emitter and receiver, order two sets.
**∗2.** There are restrictions to the application conditions depending on the protective height of the Curtain. Refer to the Water-resistant Case on page 303.
**∗3.** The same four digits indicating protective height that are used in the Sensor model number (□□□□) are used in the □□□□ part of the Case model number.
**∗4.** Be sure to purchase brackets with the Case to match the mounting direction (rear or side).

# Specifications (For details, refer to the instruction manual or User's manual.)

## Main Units

### F3SJ-A□□□□P14/P20/P25/P30/P55/N14/N20/N25/N30/N55

| Model | PNP outputs | F3SJ-A□□□□P14 | F3SJ-A□□□□P20 | F3SJ-A□□□□P25 | F3SJ-A□□□□P30 | F3SJ-A□□□□P55 |
|---|---|---|---|---|---|---|
| | NPN outputs | F3SJ-A□□□□N14 | F3SJ-A□□□□N20 | F3SJ-A□□□□N25 | F3SJ-A□□□□N30 | F3SJ-A□□□□N55 |
| **Sensor type** | | Type 4 safety light curtain | | | | |
| **Version** | | Ver. 2 | | | | |
| **Setting tool connection** | | Connectable | | | | |
| **Applicable safety category** | | Category 4, 3, 2, 1, or B | | | | |
| **Detection capability** | | Opaque objects<br>14 mm in diameter | Opaque objects<br>20 mm in diameter | Opaque objects<br>25 mm in diameter | Opaque objects<br>30 mm in diameter | Opaque objects<br>55 mm in diameter |
| **Beam gap (P)** | | 9 mm | 15 mm | 20 mm | 25 mm | 50 mm |
| **Number of beams (n)** | | 26 to 180 | 16 to 166 | 13 to 125 | 10 to 100 | 6 to 50 |
| **Protective height (PH)** | | 245 to 1,631 mm | 245 to 2,495 mm | 260 to 2,500 mm | | 270 to 2,470 mm |
| **Lens diameter** | | Diameter 5 mm | | | | |
| **Operating range** ✻ | | 0.2 to 9 m (protective height 1,640 mm max.),<br>0.2 to 7 m (protective height 1,655 mm min.)<br>(Depending on the setting tool, the detection distance can be shortened to 0.5 m.) | | | | |
| **Response time (under stable light incident condition) (For details, see "Response Time" on page 301.)** | **ON to OFF** | 1 set, 0245 to 983: 11 ms to 17.5 ms max.<br>1,055 or higher: 20 ms to 25 ms max. | 1 set, 0245 to 1,205: 10 ms to 15 ms max.<br>1,235 or higher: 17.5 ms to 22.5 ms max. | 1 set, 0260 to 1,600: 10 ms to 15 ms max.<br>1,620 or higher: 17.5 ms to 20.0 ms max. | 1 set: 10 ms to 17.5 ms max. | 1 set: 10 ms to 13 ms max. |
| | **OFF to ON** | 1 set, 0245 to 983: 44 ms to 70 ms max.<br>1,055 or higher: 80 ms to 100 ms max. | 1 set, 0245 to 1,205: 40 ms to 60 ms max.<br>1,235 or higher: 70 ms to 90 ms max. | 1 set, 0260 to 1,600: 40 ms to 60 ms max.<br>1,620 or higher: 70 ms to 80 ms max. | 1 set: 40 ms to 70 ms max. | 1 set: 40 ms to 52 ms max. |
| **Startup waiting time** | | 2 s max. (2.2 s max. for series connection) | | | | |
| **Power supply voltage (Vs)** | | 24 VDC ±20% (ripple p-p10% max.) | | | | |
| **Current consumption (no load)** | **Emitter** | Up to 50 beams: 76 mA max., 51 to 100 beams: 106 mA max., 101 to 150 beams: 130 mA max.,<br>151 to 180 beams: 153 mA max., 201 to 234 beams: 165 mA max. | | | | |
| | **Receiver** | Up to 50 beams: 68 mA max., 51 to 100 beams: 90 mA max., 101 to 150 beams: 111 mA max.,<br>151 to 180 beams: 128 mA max., 201 to 234 beams: 142 mA max. | | | | |
| **Light source (emitted wavelength)** | | Infrared LED (870 nm) | | | | |
| **Effective aperture angle (EAA)** | | Based on IEC61496-2. Within ±2.5° for both emitter and receiver when the detection distance is 3 m or over | | | | |
| **Control outputs (OSSD)** | **PNP outputs** | Two PNP transistor outputs, load current 300 mA max., residual voltage 2 V max. (except for voltage drop due to cable extension), allowable capacity load 2.2 μF, leak current 1 mA max.<br>(This can be different from traditional logic (ON/OFF) because safety circuit is used.) | | | | |
| | **NPN outputs** | Two NPN transistor outputs, load current 300 mA max., residual voltage 2 V max. (except for voltage drop due to cable extension), allowable capacity load 2.2 μF, leak current 2 mA max.<br>(This can be different from traditional logic (ON/OFF) because safety circuit is used.) | | | | |
| **Auxiliary output 1 (non-safety output)** | **PNP output** | One PNP transistor output, load current 300 mA max., residual voltage 2 V max. (except for voltage drop due to cable extension), leak current 1 mA max. | | | | |
| | **NPN output** | One NPN transistor output, load current 300 mA max., residual voltage 2 V max. (except for voltage drop due to cable extension), leak current 1 mA max. | | | | |
| **Auxiliary output 2 (non-safety output, basic system functions)** | **PNP output** | One PNP transistor output, load current 50 mA max., residual voltage 2 V max. (except for voltage drop due to cable extension), leak current 1 mA max. | | | | |
| | **NPN output** | One NPN transistor output, load current 50 mA max., residual voltage 2 V max. (except for voltage drop due to cable extension), leak current 1 mA max. | | | | |
| **External indicator output (non-safety output)** | | Available indicators<br>• Incandescent lamp: 24 VDC, 3 to 7 W<br>• LED lamp: Load current 10 mA to 300 mA max., leak current 1 mA max.<br>(To use an external indicator, an F39-JJ3N universal indicator cable or an F39-A01P□-PAC dedicated external indicator kit is required.) | | | | |
| **Output operation mode** | **Receiver** | Control outputs 1, 2:ON when receiving light<br>Auxiliary output 1:Inverse of control output signals (Operating mode can be changed with the setting tool.)<br>External indicator output 1:Inverse of control output signals for a basic system (Operating mode can be changed with the setting tool.)<br>ON when muting/override for a muting system (Operating mode can be changed with the setting tool.) | | | | |
| | **Emitter** | Auxiliary output 2: Turns ON when the point of 30,000 operating hours is reached<br>(Operating mode can be changed with the setting tool.)<br>External indicator output 2:ON when lock-out for a basic system (Operating mode can be changed with the setting tool.)<br>ON when muting/override for a muting system (Operating mode can be changed with the setting tool.) | | | | |

✻ Use of the Spatter Protection Cover causes a 10% maximum sensing distance attenuation.

| Model | PNP outputs | F3SJ-A□□□□P14 | F3SJ-A□□□□P20 | F3SJ-A□□□□P25 | F3SJ-A□□□□P30 | F3SJ-A□□□□P55 |
|---|---|---|---|---|---|---|
| | NPN outputs | F3SJ-A□□□□N14 | F3SJ-A□□□□N20 | F3SJ-A□□□□N25 | F3SJ-A□□□□N30 | F3SJ-A□□□□N55 |
| Input voltage | PNP output | Test input, interlock selection input, reset input, and muting input are all<br>ON voltage:9 to 24 V (Vs) (sink current: 3 mA max.)<br>OFF voltage:0 to 1.5 V, or open<br>External device monitoring input<br>ON voltage:9 to 24 V (Vs) (sink current: 5 mA max.)<br>OFF voltage:0 to 1.5 V, or open | | | | |
| | NPN output | Test input, interlock selection input, reset input, and muting input are all<br>ON voltage:0 to 1.5 V (short-circuit current 3 mA max.)<br>OFF voltage:9 to 24 V, or open<br>External device monitoring input<br>ON voltage:0 to 1.5 V (short-circuit current 5 mA max.)<br>OFF voltage:9 to 24 V, or open | | | | --- |
| Indicators | Emitter | Light intensity level indicators (green LED × 2, orange LED × 3): ON based on the light intensity<br>Error mode indicators (red LED × 3): Blink to indicate error details<br>Power indicator (green LED × 1): ON while power is on<br>Interlock indicator (yellow LED × 1): ON while under interlock, blinks at lockout.<br>External device monitoring indicator (muting input 1 indicator), Blanking/test indicator (muting input 2 indicator) (green LED × 2): ON/flash according to function | | | | |
| | Receiver | Light intensity level indicators (green LED × 2, orange LED × 3): ON based on the light intensity<br>Error mode indicators (red LED × 3): Blink to indicate error details<br>OFF output indicator (red LED × 1): ON when safety output is OFF, blinks at lockout.<br>ON output indicator (green LED × 1): ON while safety output is ON muting error indicator, Blanking /test indicator (green LED × 2): ON/flash according to function | | | | |
| Mutual interference prevention function | | Interference light prevention algorithm, detection distance change function | | | | |
| Series connection | | Time division emission by series connection<br>• Number of connections: up to 4 sets<br>• Total number of beams: up to 400 beams<br>• Maximum cable length for 2 sets: no longer than 15 m<br>• Response time under connection: See page 301 | | | | |
| Test functions | | • Self test (when power is turned ON and while power is supplied)<br>• External test (emission stop function by test input) | | | | |
| Safety functions | | • Start interlock, restart interlock (Must be set with a setting tool when the muting function is used.)<br>• External device monitor<br>• Muting (Lamp burnout detection, override function included. F39-CN6 key cap for muting is required.)<br>• Fixed blanking (must be set by a setting tool)<br>• Floating blanking (must be set by a setting tool) | | | | |

| Model | PNP outputs | F3SJ-A□□□□P14 | F3SJ-A□□□□P20 | F3SJ-A□□□□P25 | F3SJ-A□□□□P30 | F3SJ-A□□□□P55 |
|---|---|---|---|---|---|---|
| | NPN outputs | F3SJ-A□□□□N14 | F3SJ-A□□□□N20 | F3SJ-A□□□□N25 | F3SJ-A□□□□N30 | F3SJ-A□□□□N55 |
| **Connection type** | | Connectors (M12, 8-pin) | | | | |
| **Protective circuits** | | Output short-circuit protection, and power supply reverse polarity protection | | | | |
| **Ambient temperature** | | Operating: −10 to 55°C (no icing), Storage: −30 to 70°C | | | | |
| **Ambient humidity** | | Operating: 35% to 85% (no condensation), Storage: 35% to 95% | | | | |
| **Ambient operating light intensity** | | Incandescent lamp: 3,000 lx max. (light intensity on the receiver surface), Sunlight: 10,000 lx max. (light intensity on the receiver surface) | | | | |
| **Insulation resistance** | | 20 MΩ min. (at 500 VDC) | | | | |
| **Dielectric strength** | | 1,000 VAC 50/60 Hz, 1 min | | | | |
| **Degree of protection** | | IP65 (IEC60529) | | | | |
| **Vibration resistance** | | Malfunction: 10 to 55 Hz, 0.7-mm double amplitude, 20 sweeps in X, Y, and Z directions | | | | |
| **Shock resistance** | | Malfunction: 100 $m/s^2$, 1,000 times each in X, Y, and Z directions | | | | |
| **Materials** | | Casing (including metal parts on both ends): Aluminum, zinc die-cast<br>Cap: ABS resin<br>Optical cover: PMMA resin (acrylic)<br>Cable: Oil resistant PVC | | | | |
| **Weight (packed state)** | | Calculate using the following equations:<br>(1) For F3SJ-A□□□□□14, weight (g)=(protective height) × 1.7 + α<br>(2) For F3SJ-A□□□□□20/F3SJ-A□□□□□25/F3SJ-A□□□□□30, weight (g)=(protective height) × 1.5 + α<br>(3) For F3SJ-A□□□□□55, weight (g)=(protective height) × 1.4 + α<br>The values for α are as follows:<br>Protected height 245 to 596 mm: α = 1,100 protected height 1,660 to 2,180 mm: α = 2,400<br>Protected height 600 to 1,130 mm: α = 1,500 protected height 2,195 to 2,500 mm: α = 2,600<br>Protected height 1,136 to 1,658 mm: α = 2,000 | | | | |
| **Accessories** | | Test rod (✻1), instruction manual, mounting brackets (top and bottom), mounting brackets (intermediate) (✻2), error mode label, User's Manual (CD-ROM)<br>**✻1.** The F3SJ-A□□□□□55 is not included.<br>**✻2.** Number of intermediate mounting brackets depends on protective height of F3SJ.<br>• For protective height from 600 to 1,130 mm: 1 set for each of the emitter and receiver is included<br>• For protective height from 1,136 to 1,658 mm: 2 sets for each of the emitter and receiver are included<br>• For protective height from 1,660 to 2,180 mm: 3 sets for each of the emitter and receiver are included<br>• For protective height from 2,195 to 2,500 mm: 4 sets for each of the emitter and receiver are included | | | | |
| **Applicable standards** | | IEC61496-1, EN61496-1 UL61496-1, Type 4 ESPE (Electro-Sensitive Protective Equipment)<br>IEC61496-2, prEN61496-2, UL61496-2, Type 4 AOPD (Active Opto-electronic Protective Devices)<br>IEC61508, EN61508 SIL3 | | | | |

## F3SJ-A□□□□P20-TS/P25-TS

| Model | | F3SJ-A□□□□P20-TS | F3SJ-A□□□□P25-TS |
|---|---|---|---|
| Sensor type | | Type 4 safety light curtain | |
| Version | | Ver. 2 | |
| Setting tool connection | | Parameter setting: Not possible<br>Monitoring: Possible | |
| Applicable safety category | | Category 4, 3, 2, 1, or B | |
| Detection capability | | Opaque objects<br>20 mm in diameter | Opaque objects<br>25 mm in diameter |
| Beam gap (P) | | 15 mm | 20 mm |
| Number of beams (n) | | 16 to 166 | 13 to 125 |
| Protective height (PH) | | 245 to 2,495 mm | 260 to 2,500 mm |
| Lens diameter | | Diameter 5 mm | |
| Operating range | | 0.2 to 9 m (protective height 1,640 mm max.), 0.2 to 7 m (protective height 1,655 mm max.) | |
| Response time (under stable light incident condition) (For details, see "Response Time" on page 301.) | ON to OFF | 1 set, 0245 to 1,205: 10 ms to 15 ms max.<br>1,220 or higher: 17.5 ms to 22.5 ms max.<br>3 sets (240 beams): 45.5 ms | 1 set, 0260 to 1,600: 10 ms to 15 ms max.<br>1,620 or higher: 17.5 ms to 20.0 ms max.<br>3 sets (240 beams): 45.5 ms |
| | OFF to ON | 1 set, 0245 to 1,205: 40 ms to 60 ms max.<br>1,220 or higher: 70 ms to 90 ms max.<br>3 sets (240 beams): 200 ms | 1 set, 0260 to 1,600: 40 ms to 60 ms max.<br>1,620 or higher: 70 ms to 80 ms max.<br>3 sets (240 beams): 200 ms |
| Startup waiting time | | 2 s max. (2.2 s max. for series connection) | |
| Power supply voltage (Vs) | | 24 VDC ±20% (ripple p-p10% max.) | |
| Current consumption (no load) | Emitter | Up to 50 beams: 76 mA max., 51 to 100 beams: 106 mA max., 101 to 150 beams: 130 mA max.,<br>151 to 166 beams: 153 mA max | |
| | Receiver | Up to 50 beams: 68 mA max., 51 to 100 beams: 90 mA max., 101 to 150 beams: 111 mA max.,<br>151 to 166 beams: 128 mA max. | |
| Light source (emitted wavelength) | | Infrared LED (870 nm) | |
| Effective aperture angle (EAA) | | Based on IEC61496-2. Within ±2.5° for both emitter and receiver when the detection distance is 3 m or over | |
| Control outputs (OSSD) | | Two PNP transistor outputs, load current 300 mA max., residual voltage 2 V max. (except for voltage drop due to cable extension), allowable capacity load 2.2 μF, leak current 1 mA max.<br>(This can be different from traditional logic (ON/OFF) because safety circuit is used.) | |
| Auxiliary output 1 (non-safety output) | | One PNP transistor output, load current 300 mA max., residual voltage 2 V max. (except for voltage drop due to cable extension), leak current 1 mA max. | |
| External indicator output (non-safety output) | | Available indicators<br>• Incandescent lamp: 24 VDC, 3 to 7 W<br>• LED lamp: Load current 10 mA to 300 mA max., leak current 1 mA max.<br>(To use an external indicator, an F39-JJ3N universal indicator cable or an F39-A01P□-PAC dedicated external indicator kit is required.) | |
| Output operation mode | Receiver | Control outputs 1, 2: ON when receiving light<br>Auxiliary output 1: Inverse of control output signals<br>External indicator output 1: Inverse of control output signals for a basic system<br>ON when muting/override for a muting system | |
| | Emitter | External indicator output 2: ON when lock-out for a basic system<br>ON when muting/override for a muting system | |
| Input voltage | | Test input, reset input, and muting input are all<br>ON voltage:9 to 24 V (Vs) (sink current: 3 mA max.)<br>OFF voltage:0 to 1.5 V, or open<br>External device monitoring input<br>ON voltage:9 to 24 V (Vs) (sink current: 5 mA max.)<br>OFF voltage:0 to 1.5 V, or open | |
| Indicators | Emitter | Light intensity level indicators (green LED × 2, orange LED × 3): ON based on the light intensity<br>Error mode indicators (red LED × 3): Blink to indicate error details<br>Power indicator (green LED × 1): ON while power is on<br>Lockout indicator (yellow LED × 1): Blinks to indicate lockout.<br>External device monitoring indicator (muting input 1 indicator), Test indicator (muting input 2 indicator) (green LED × 2): ON/flash according to function | |
| | Receiver | Light intensity level indicators (green LED × 2, orange LED × 3): ON based on the light intensity<br>Error mode indicators (red LED × 3): Blink to indicate error details<br>OFF output indicator (red LED × 1): ON when safety output is OFF, blinks at lockout.<br>ON output indicator (green LED × 1): ON while safety output is ON muting error indicator, Test indicator (green LED × 2): ON/flash according to function | |

| Model | F3SJ-A□□□□P20-TS | F3SJ-A□□□□P25-TS |
|---|---|---|
| **Mutual interference prevention function** | Interference light prevention algorithm | |
| **Series connection** | Time division emission by series connection<br>• Number of connections: up to 3 sets<br>• Total number of beams: up to 240 beams<br>• Maximum cable length for 2 sets: no longer than 15 m<br>• Response time under connection: See page 301 | |
| **Test functions** | • Self test (when power is turned ON and while power is supplied)<br>• External test (emission stop function by test input) | |
| **Safety functions** | • External device monitor<br>• Muting (Override function included. F39-CN6 Key Cap for muting is required.)<br>Lockout occurs under either of the following conditions:<br>• When more than 3 Units are connected in series.<br>• When the total number of beams connected in series exceeds 240.<br>• When any model other than a "-TS" model is included in a series connection. | |
| **Connection type** | Connectors (M12, 8-pin) | |
| **Protective circuits** | Output short-circuit protection, and power supply reverse polarity protection | |
| **Ambient temperature** | Operating: –10 to 55°C (no icing), Storage: –30 to 70°C | |
| **Ambient humidity** | Operating: 35% to 85% (no condensation), Storage: 35% to 95% | |
| **Ambient operating light intensity** | Incandescent lamp: 3,000 lx max. (light intensity on the receiver surface), Sunlight: 10,000 lx max. (light intensity on the receiver surface) | |
| **Insulation resistance** | 20 MΩ min. (at 500 VDC) | |
| **Dielectric strength** | 1,000 VAC 50/60 Hz, 1 min | |
| **Degree of protection** | IP65 (IEC60529) | |
| **Vibration resistance** | Malfunction: 10 to 55 Hz, 0.7-mm double amplitude, 20 sweeps in X, Y, and Z directions | |
| **Shock resistance** | Malfunction: 100 $m/s^2$, 1,000 times each in X, Y, and Z directions | |
| **Materials** | Casing (including metal parts on both ends): Aluminum, zinc die-cast<br>Cap: ABS resin<br>Optical cover: PMMA resin (acrylic)<br>Cable: Oil resistant PVC | |
| **Weight (packed state)** | Calculate using the following equations:<br>For F3SJ-A□□□□P□□-TS, weight (g)=(protective height) × 1.5 + α<br>The values for α are as follows:<br>Protected height 245 to 590 mm: α = 1,100 protected height 1,660 to 2,180 mm: α = 2,400<br>Protected height 600 to 1,130 mm: α = 1,500 protected height 2,195 to 2,500 mm: α = 2,600<br>Protected height 1,140 to 1,655 mm: α = 2,000 | |
| **Accessories** | Test rod, instruction manual, mounting brackets (top and bottom), mounting brackets (intermediate) (✻), error mode label, User's Manual (CD-ROM)<br>✻ Number of intermediate mounting brackets depends on protective height of F3SJ.<br>• For protective height from 600 to 1,130 mm: 1 set for each of the emitter and receiver is included<br>• For protective height from 1,140 to 1,655 mm: 2 sets for each of the emitter and receiver are included<br>• For protective height from 1,660 to 2,180 mm: 3 sets for each of the emitter and receiver are included<br>• For protective height from 2,195 to 2,500 mm: 4 sets for each of the emitter and receiver are included | |
| **Applicable standards** | IEC61496-1, EN61496-1 UL61496-1, Type 4 ESPE (Electro-Sensitive Protective Equipment)<br>IEC61496-2, prEN61496-2, UL61496-2, Type 4 AOPD (Active Opto-electronic Protective Devices)<br>IEC61508, EN61508 SIL3 | |

## Response Time

| Model | Protective Height (mm) | Number of Beams | Response time ms (ON to OFF) | Response time ms (OFF to ON) |
|---|---|---|---|---|
| **F3SJ-A□14 series** | 245 to 263 | 26 to 28 | 11 | 44 |
| | 281 to 389 | 30 to 42 | 12 | 48 |
| | 407 to 497 | 44 to 54 | 13 | 52 |
| | 515 to 605 | 56 to 66 | 14 | 56 |
| | 623 to 731 | 68 to 80 | 15 | 60 |
| | 767 to 983 | 84 to 108 | 17.5 | 70 |
| | 1,055 to 1,271 | 116 to 140 | 20 | 80 |
| | 1,343 to 1,559 | 148 to 172 | 22.5 | 90 |
| | 1,631 | 180 | 25 | 100 |
| **F3SJ-A□20 series F3SJ-A□P20-TS series** | 245 | 16 | 10 | 40 |
| | 275 to 425 | 18 to 28 | 11 | 44 |
| | 455 to 635 | 30 to 42 | 12 | 48 |
| | 665 to 815 | 44 to 54 | 13 | 52 |
| | 845 to 995 | 56 to 66 | 14 | 56 |
| | 1,025 to 1,205 | 68 to 80 | 15 | 60 |
| | 1,235 to 1,655 | 82 to 110 | 17.5 | 70 |
| | 1,805 to 2,105 | 120 to 140 | 20 | 80 |
| | 2,255 to 2,495 | 150 to 166 | 22.5 | 90 |
| **F3SJ-A□25 series F3SJ-A□P25-TS series** | 260 to 320 | 13 to 16 | 10 | 40 |
| | 340 to 580 | 17 to 29 | 11 | 44 |
| | 600 to 840 | 30 to 42 | 12 | 48 |
| | 860 to 1100 | 43 to 55 | 13 | 52 |
| | 1120 to 1340 | 56 to 67 | 14 | 56 |
| | 1360 to 1600 | 68 to 80 | 15 | 60 |
| | 1620 to 2240 | 81 to 112 | 17.5 | 70 |
| | 2260 to 2500 | 113 to 125 | 20.0 | 80 |
| **F3SJ-A□30 series** | 245 to 395 | 10 to 16 | 10 | 40 |
| | 420 to 720 | 17 to 29 | 11 | 44 |
| | 745 to 1,045 | 30 to 42 | 12 | 48 |
| | 1,070 to 1,295 | 43 to 52 | 13 | 52 |
| | 1,395 to 1,620 | 56 to 65 | 14 | 56 |
| | 1,745 to 1,995 | 70 to 80 | 15 | 60 |
| | 2,120 to 2,495 | 85 to 100 | 17.5 | 70 |
| **F3SJ-A□55 series** | 270 to 770 | 6 to 16 | 10 | 40 |
| | 820 to 1420 | 17 to 29 | 11 | 44 |
| | 1470 to 2070 | 30 to 42 | 12 | 48 |
| | 2120 to 2470 | 43 to 50 | 13 | 52 |

**Note:** Use the following expressions for series connection.

For 2-set series connection:

Response time (ON to OFF): Response time of the 1st unit + Response time of the 2nd unit - 1 (ms)

Response time (OFF to ON): Response time calculated by the above x 4 (ms)

For 3-set series connection:

Response time (ON to OFF): Response time of the 1st unit + Response time of the 2nd unit + Response time of 3rd unit - 5 (ms)

Response time (OFF to ON): Response time calculated by the above x 5 (ms)
(For models with the "-TS" suffix, multiply the response time obtained by the above x 5 (ms), or use 200 ms, whichever is less.)

For 4-set series connection:

Response time (ON to OFF): Response time of the 1st unit + Response time of the 2nd unit + Response time of the 3rd unit + Response time of the 4th unit - 8 (ms)

Response time (OFF to ON): Response time calculated by the above x 5 (ms)

## Cable Extension Length

Total cable extension length must be no greater than the lengths described below.

**When the F3SJ and an external power supply are directly connected, or when the F3SJ is connected to a G9SA-300-SC.**

| Condition | 1 set | 2 sets | 3 sets | 4 sets |
|---|---|---|---|---|
| **Using incandescent lamp for auxiliary output and external indicator output** | 45 m | 40 m | 30 m | 20 m |
| **Not using incandescent lamp** | 100 m | 60 m | 45 m | 30 m |

**When connected to the F3SP-B1P.**

| Condition | 1 set | 2 sets | 3 sets | 4 sets |
|---|---|---|---|---|
| **Using incandescent lamp for external indicator output 2** | 40 m | 30 m | 25 m | 20 m |
| **Using incandescent lamp for external indicator output 1** | 60 m | 45 m | 30 m | 20 m |
| **Using incandescent lamp for auxiliary output 1** | | | | |
| **Not using incandescent lamp** | 100 m | 60 m | 45 m | 30 m |

**Note:** Keep the cable length within the rated length. Failure to do so is dangerous as it may prevent safety functions from operating normally.

# Accessories

## Control Unit

| Item | | Model | F3SP-B1P |
|---|---|---|---|
| Applicable sensor | | | F3SJ-A (Only for PNP output type) ✻ |
| Power supply voltage | | | 24 VDC±10% |
| Power consumption | | | DC1.7 W max. (not including sensor's current consumption) |
| Operation time | | | 100 ms max. (not including sensor's response time) |
| Response time | | | 10 ms max. (not including sensor's response time) |
| Relay output | Number of contacts | | 3NO+1NC |
| | Rated load | | 25 VAC 5 A (cosϕ= 1),<br>30 VDC 5 A L/R = 0 ms |
| | Rated current | | 5 A |
| Connection type | Between sensors | | M12 connector (8-pin) |
| | Others | | Terminal block |
| Weight (packed state) | | | Approx. 280 g |
| Accessories | | | Instruction manual |

✻ NPN output type cannot be connected. Also, the system cannot be used as a muting system.

## Dedicated External Indicator Set

| Item | Model | F39-A01PR-PAC | F39-A01PG-PAC | F39-A01PY-PAC |
|---|---|---|---|---|
| Applicable sensor | | F3SJ-A<br>(Common for PNP/NPN output type. Can be attached to emitters and/or receivers) | | |
| Light source | | Red LED | Green LED | Yellow LED |
| Power supply voltage | | 24 VDC±10% (supplied by sensor) | | |
| Consumption current | | 50 mA max. (supplied by sensor) | | |
| Connection type | | Dedicated accessory connector cable<br>(Sensor side: Dedicated 10-pin connector, Indicator side: M12 8-pin connector) | | |
| Set contents | | Indicator (red), Dedicated connector cable (0.1 m), Dedicated mounting brackets (1 for each) | Indicator (green), Dedicated connector cable (0.1 m), Dedicated mounting brackets (1 for each) | Indicator (yellow), Dedicated connector cable (0.1 m), Dedicated mounting brackets (1 for each) |

## Water-resistant Case

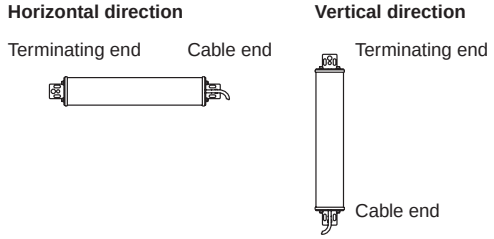
| Item | Model | F39-EJ□□□□-L, F39-EJ□□□□-D | |
|---|---|---|---|
| Applicable sensor | | F3SJ-series Curtains with a protective height of 600 mm max. | F3SJ-series Curtains with a protective height of 605 mm min. |
| Ambient temperature | | -10 to 55°C (operation and storage) | 13 to 33°C (operation and storage) |
| Mounting direction | | No restrictions | Vertical direction only (see following diagram) |
| Operating range | | 0.2 to 7 m (for a protective height of 1,631 mm max.), 0.2 to 5 m (for a protective height of 1,655 mm min.) | |
| Degree of protection | | IP67 (IEC60529) (When assembled according to the application precautions) | |
| Materials | | Case: Acrylic resin, Rubber: Nitrile rubber, M5 bolt: SUSXM7, M4 bolt: SUS316L,<br>Cable: Oil-resistant PVC, Plate: SUS304, Mounting Bracket (optional): SUS304 | |
| Weight (packed state) | | Calculation formula: Weight (g) = 1.5 x □□□□ + 300 (□□□□ stands for the four digits of the model number (protective height))<br>(The optional Mounting Brackets come in a set of two, and weigh 120 g. This weight is not included in the above formula.) | |

**Note: 1.** Vibration
When using Curtains with a protective height of 605 mm or more, the vibration performance of the applicable sensor is reduced. Do not use these Curtains in locations that are subject to vibration.

**2.** Protective height
When using these cases, the protective height of the applicable sensor is reduced. Check the rating and performance prior to use.

**3.** Mounting direction
When using Curtains with a protective height of 605 mm or more, some slackness occurs due to the weight of the Curtain. For this reason, mount these Curtains only in the vertical direction.

**Mounting direction**
**(the cable end and terminating end can be positioned in either direction)**



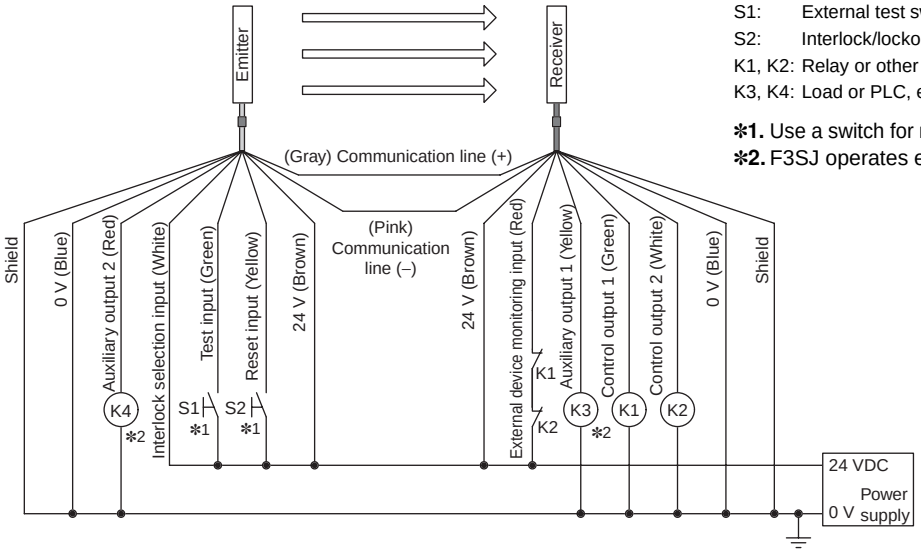
# Connections

## Basic Connection for Basic System

"Basic system" refers to the F3SJ with its default factory settings. The basic system provides basic safety light curtain functions. Most functions can be used without performing additional configuration.

### For PNP output (See page 305 for NPN output wiring.)

#### Wiring when using manual reset mode, external device monitoring

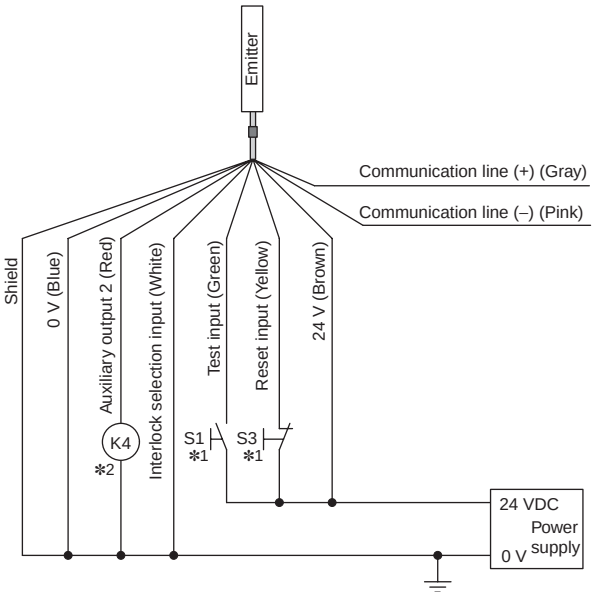



S1: External test switch (connect to 0 V if the switch is not necessary.)
S2: Interlock/lockout reset switch
K1, K2: Relay or other device that controls hazardous parts of the machine
K3, K4: Load or PLC, etc. (for monitoring)

**✻1.** Use a switch for micro loads (Input specifications: 24 V, 1.8 mA).
**✻2.** F3SJ operates even when K3 and K4 are not connected.

#### Wiring for auto reset mode

- The auto reset mode will be enabled when the emitter is wired as shown below.

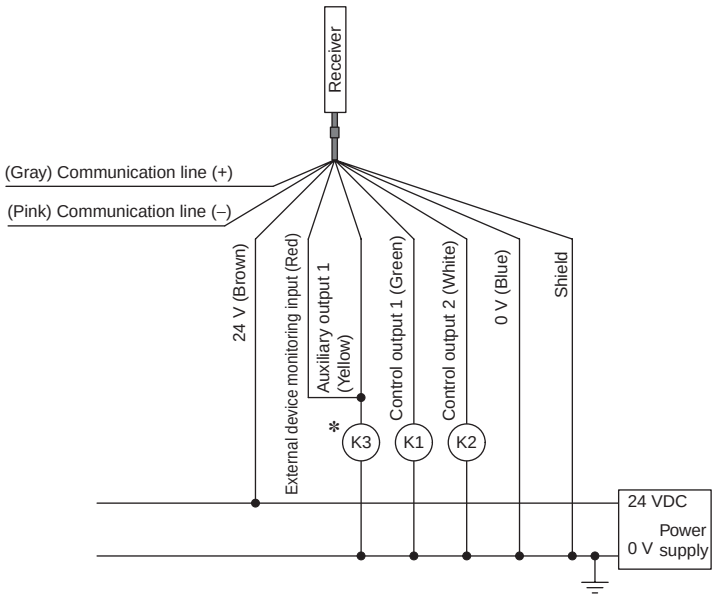



S1: External test switch (connect to 0 V if the switch is not necessary.)
S3: Lockout reset switch (connect to 24 V if the switch is not necessary)
K4: Load or PLC, etc. (for monitoring)

**✻1.** Use a switch for micro loads (Input specifications: 24 V, 1.8 mA).
**✻2.** F3SJ operates even when K4 is not connected.

#### Wiring when the external device monitoring function will not be used

- Use a setting tool to set the external device monitoring function to "Disabled."
- When using an auxiliary output 1 that has not been changed (output operation mode is "control output data," and inverse of control output signals is "Enabled), the external device monitoring function will be disabled when auxiliary output 1 and the external device monitoring input are connected as shown below.

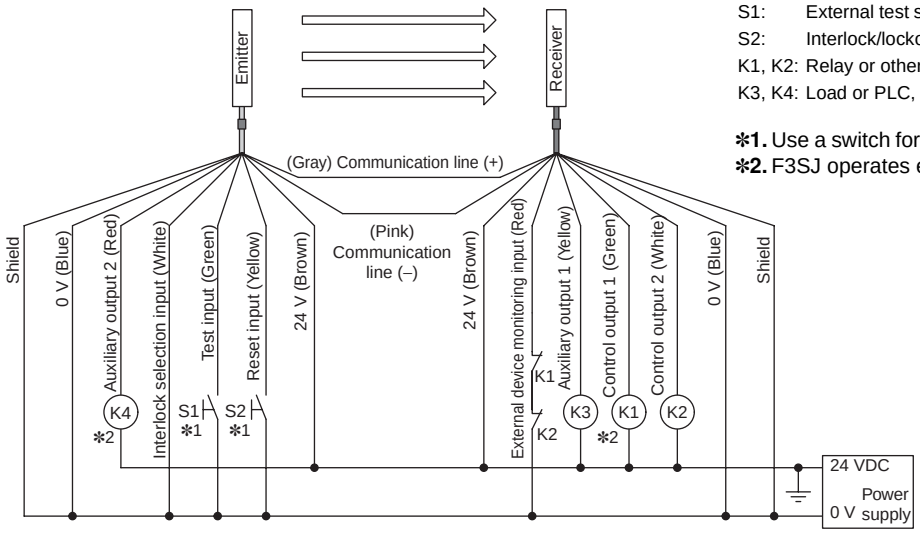



K1, K2: Relay or other device that controls hazardous parts of the machine
K3: Load or PLC, etc. (for monitoring)

✻ The F3SJ operates even when K3 is not connected. When K3 is not necessary, connect auxiliary output 1 only to the external device monitoring input.

## For NPN output (See page 304 for PNP output wiring.)

### Wiring when using manual reset mode, external device monitoring

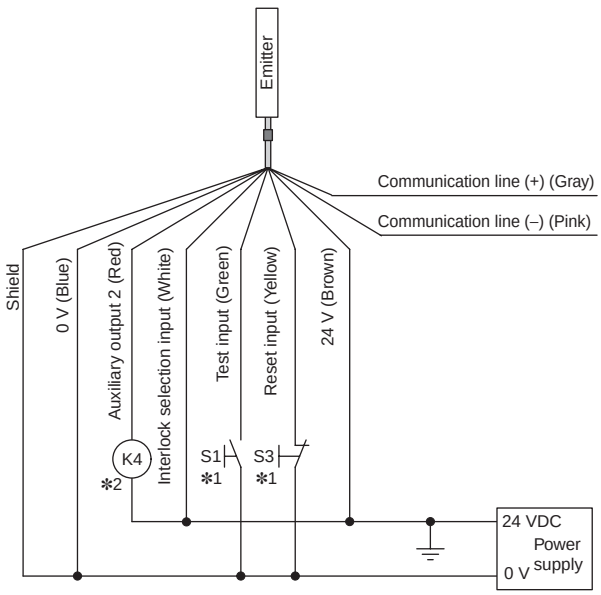



S1: External test switch (connect to 24 V if the switch is not necessary.)
S2: Interlock/lockout reset switch
K1, K2: Relay or other device that controls hazardous parts of the machine
K3, K4: Load or PLC, etc. (for monitoring)

**✻1.** Use a switch for micro loads (Input specifications: 5 V, 1 mA).
**✻2.** F3SJ operates even when K3 and K4 are not connected.

### Wiring for auto reset mode

- The auto reset mode will be enabled when the emitter is wired as shown below.

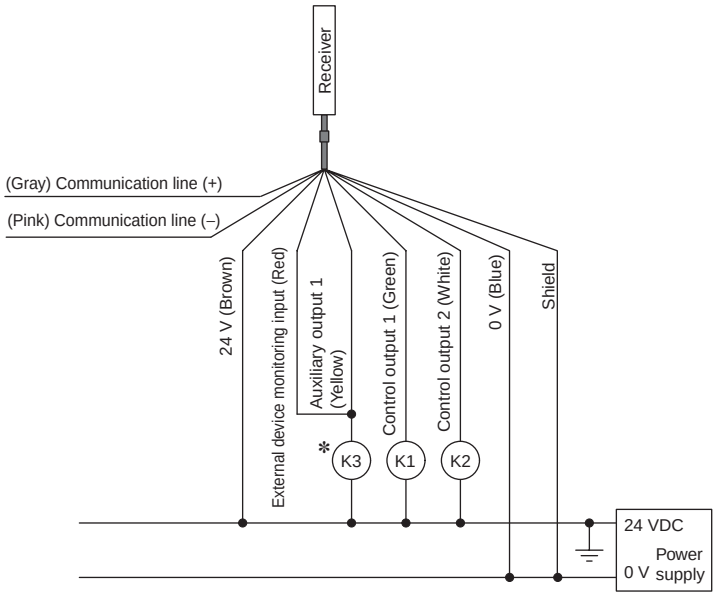



S1: External test switch (connect to 24 V if the switch is not necessary.)
S3: Lockout reset switch (connect to 0 V if the switch is not necessary)
K4: Load or PLC, etc. (for monitoring)

**✻1.** Use a switch for micro loads (Input specifications: 5 V, 1 mA).
**✻2.** F3SJ operates even when K4 is not connected.

### Wiring when the external device monitoring function will not be used

- Use a setting tool to set the external device monitoring function to "Disabled."
- When using an auxiliary output 1 that has not been changed (output operation mode is "control output data," and inverse of control output signals is "Enabled), the external device monitoring function will be disabled when auxiliary output 1 and the external device monitoring input are connected as shown below.



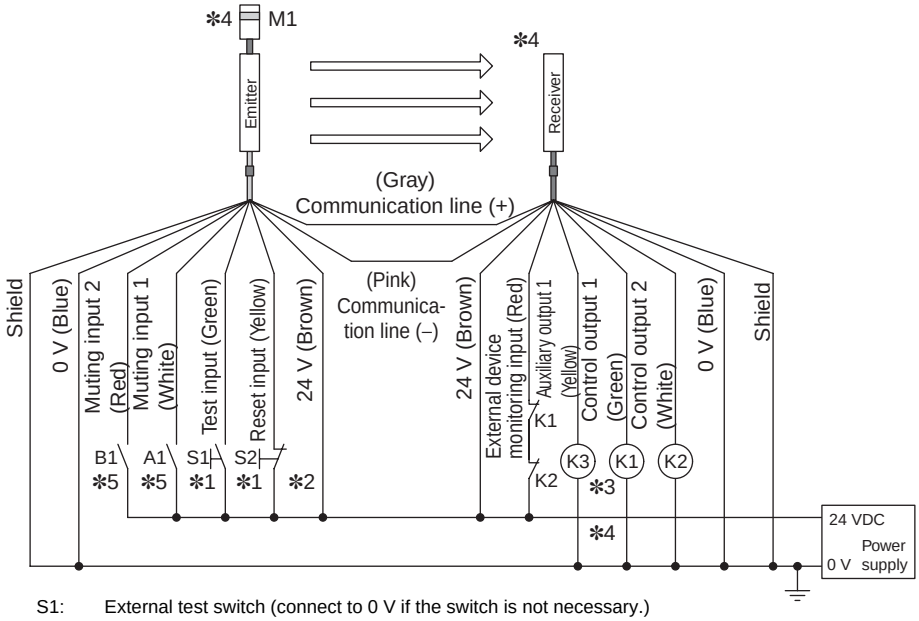

K1, K2: Relay or other device that controls hazardous parts of the machine
K3: Load or PLC, etc. (for monitoring)

✻ The F3SJ operates even when K3 is not connected. When K3 is not necessary, connect auxiliary output 1 only to the external device monitoring input.

## Basic Connection for Muting System

### For PNP output (See page 307 for NPN output wiring.)

**Wiring when using muting and external device monitoring functions**

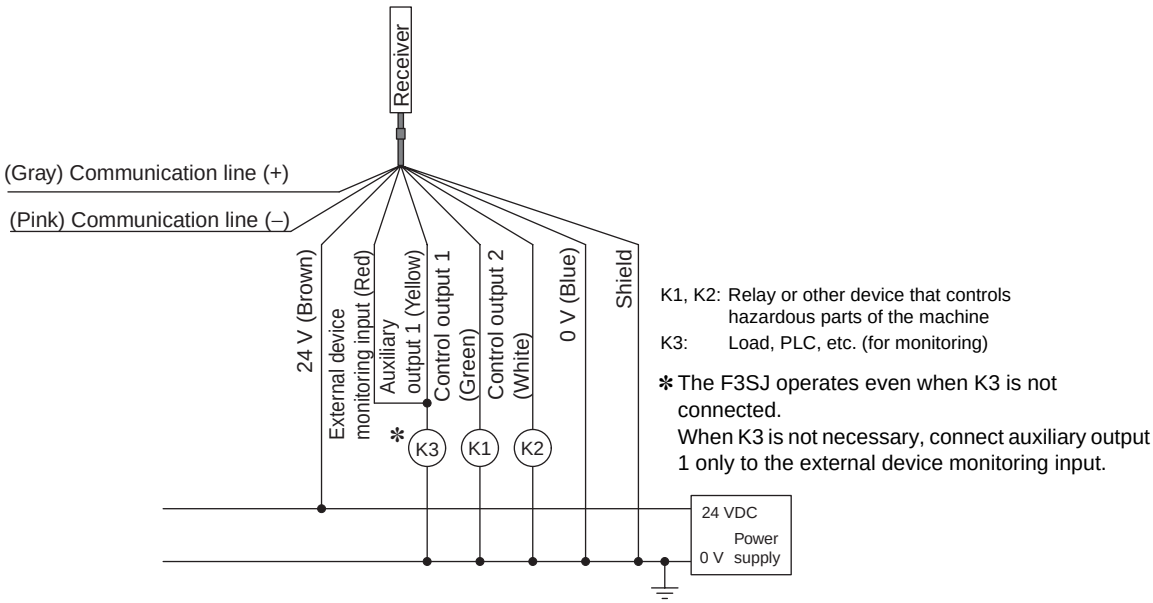



S1: External test switch (connect to 0 V if the switch is not necessary.)
S2: Lockout reset switch (connect to 24 V if the switch is not necessary.)
A1: Contact by muting sensor A1
B1: Contact by muting sensor B1
K1, K2: Relay or other device that controls hazardous parts of the machine
K3: Load or PLC, etc. (for monitoring)
M1: Muting lamp

**✻1.** Use a switch for small loads (input specifications: 24 V, 1.8 mA)
**✻2.** When using the interlock function, this also functions as an interlock reset switch. (Must be set with a setting tool.)
**✻3.** The F3SJ will operate even if K3 is not connected.
**✻4.** Connect the muting lamp to either the external indicator output or auxiliary output 1 for the emitter or the receiver. When connecting the muting lamp to auxiliary output 1, the parameter must be changed with a setting tool.
**✻5.** Two-wire sensors cannot be used.

**Wiring when the external device monitoring function will not be used**

- Use a setting tool to set the external device monitoring function to "Disabled."
- When using an auxiliary output 1 that has not been changed (output operation mode is "control output data," and inverse of control output signals is "Enabled), the external device monitoring function will be disabled when auxiliary output 1 and the external device monitoring input are connected as shown below.

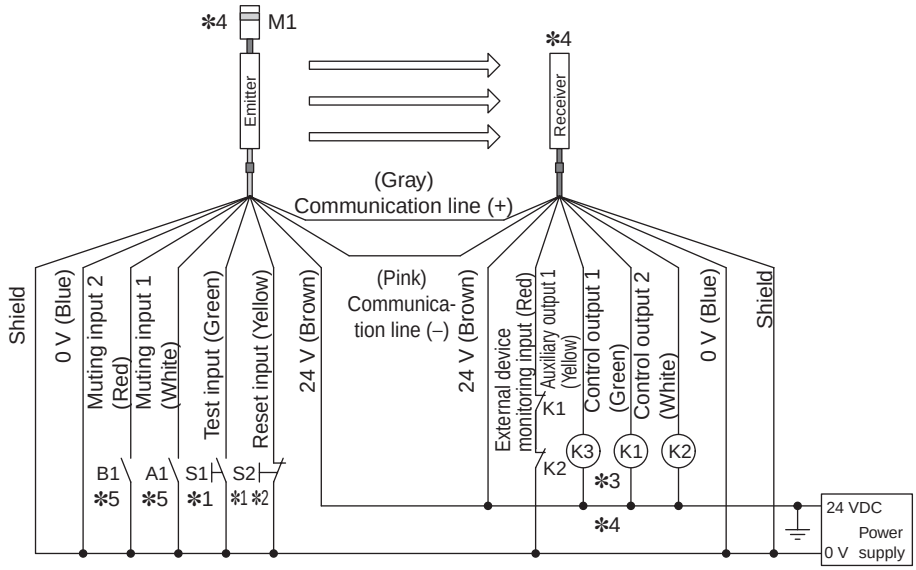



K1, K2: Relay or other device that controls hazardous parts of the machine
K3: Load, PLC, etc. (for monitoring)

✻ The F3SJ operates even when K3 is not connected.
When K3 is not necessary, connect auxiliary output 1 only to the external device monitoring input.

## For NPN output (See page 306 for PNP output wiring.)

### Wiring when using muting and external device monitoring functions

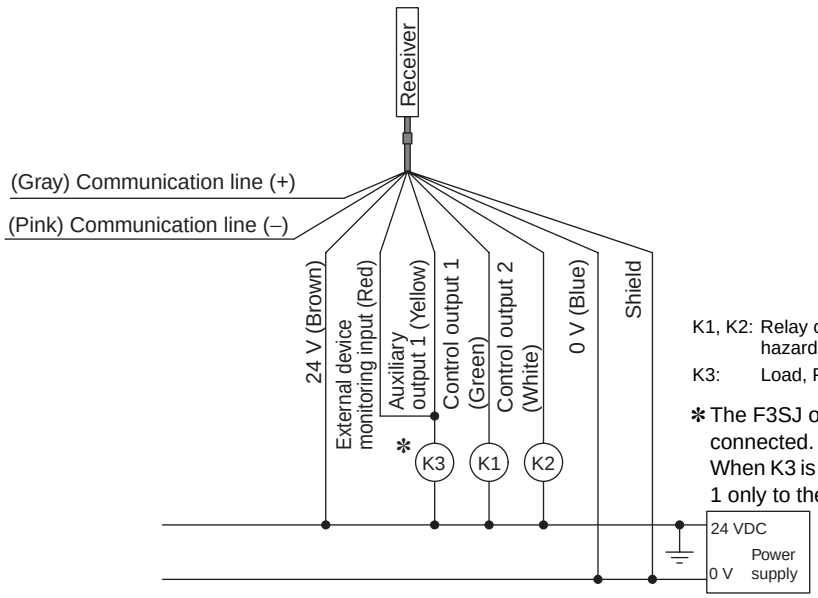



S1: External test switch (connect to 24 V if the switch is not necessary.)
S2: Lockout reset switch (connect to 0 V if the switch is not necessary.)
A1: Contact by muting sensor A1
B1: Contact by muting sensor B1
K1, K2: Relay or other device that controls hazardous parts of the machine
K3: Load or PLC, etc. (for monitoring)
M1: Muting lamp

**✻1.** Use a switch for small loads (input specifications: 5 V, 1 mA).
**✻2.** When using the interlock function, this also functions as an interlock reset switch. (Must be set with a setting tool.)
**✻3.** The F3SJ operates even when K3 is not connected.
**✻4.** Connect the muting lamp to either the external indicator output or auxiliary output 1 for the emitter or the receiver. When connecting the muting lamp to auxiliary output 1, the parameter must be changed with a setting tool.
**✻5.** Two-wire sensors cannot be used.

### Wiring when the external device monitoring function will not be used

- Use a setting tool to set the external device monitoring function to "Disabled."
- When using an auxiliary output 1 that has not been changed (output operation mode is "control output data," and inverse of control output signals is "Enabled), the external device monitoring function will be disabled when auxiliary output 1 and the external device monitoring input are connected as shown below.



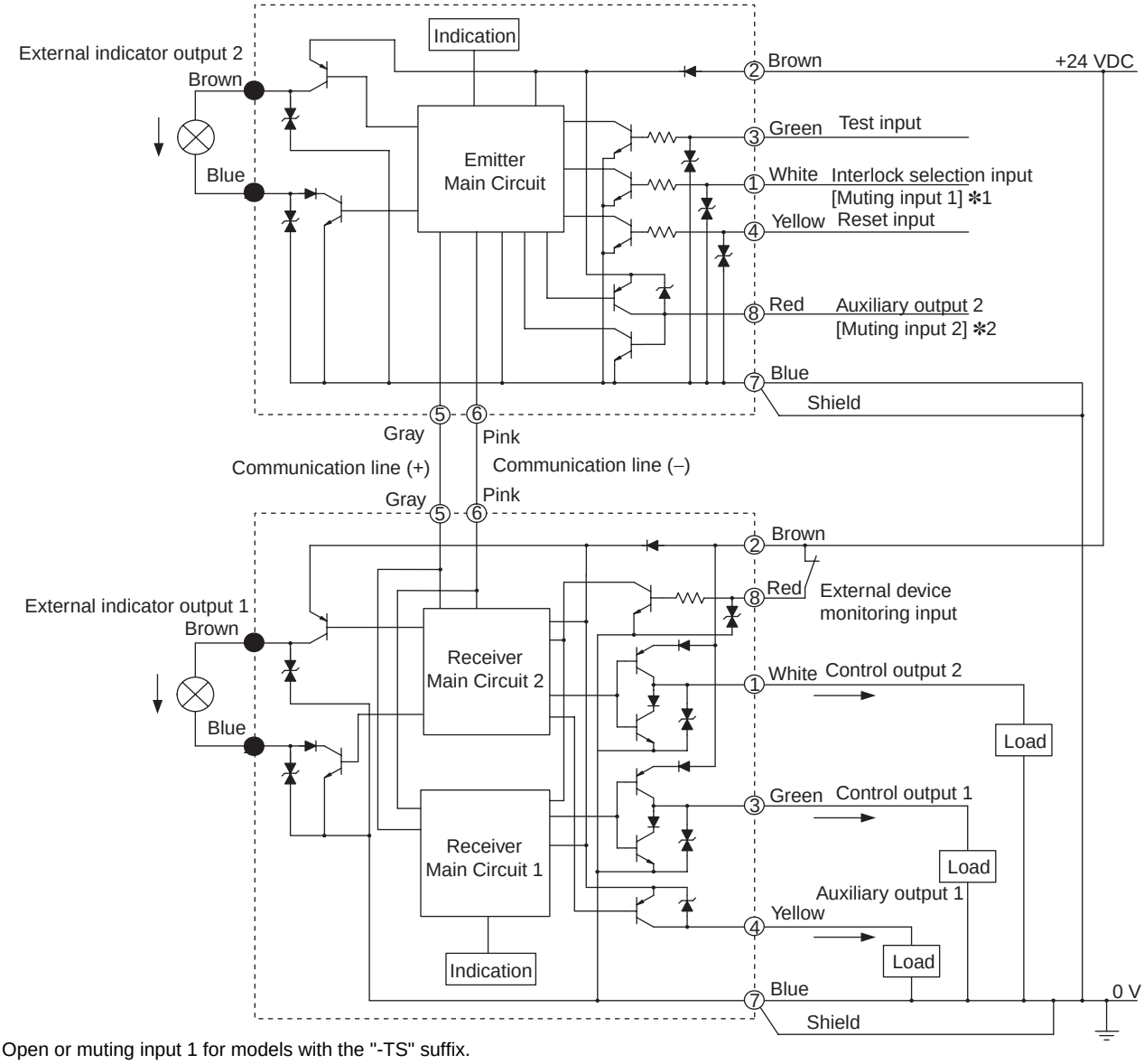

K1, K2: Relay or other device that controls hazardous parts of the machine
K3: Load, PLC, etc. (for monitoring)

✻ The F3SJ operates even when K3 is not connected.
When K3 is not necessary, connect auxiliary output 1 only to the external device monitoring input.

# I/O Circuit Diagrams

## PNP Output Type

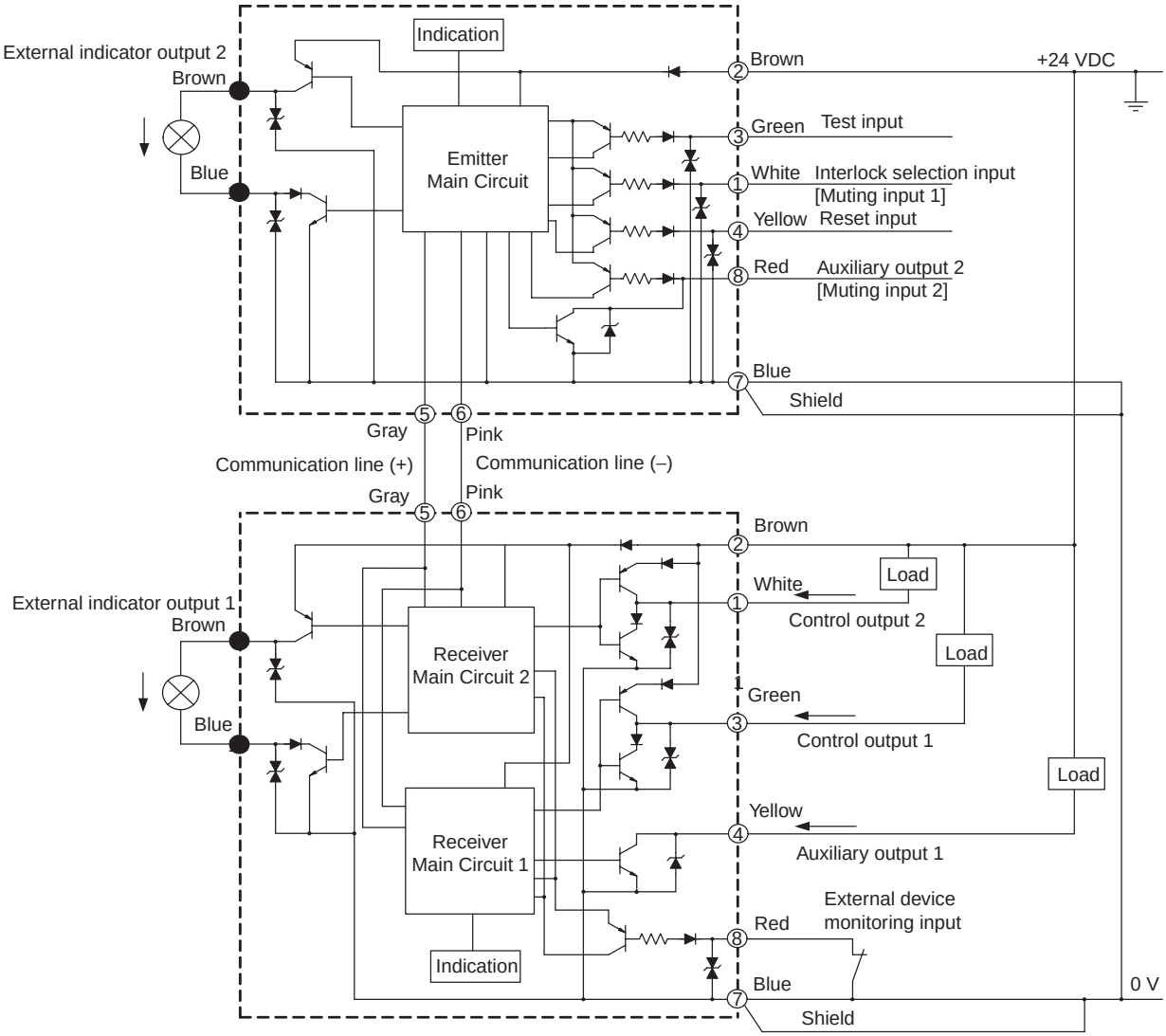
The numbers in white circles indicate the connector's pin numbers.
The black circles indicate connectors for series connection.
The words in brackets ([ ]) indicate the signal name for muting system.



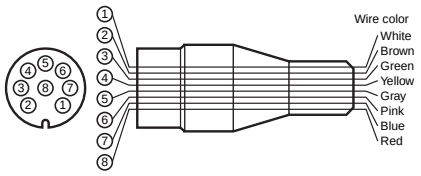

✻1. Open or muting input 1 for models with the "-TS" suffix.
✻2. Open or muting input 2 for models with the "-TS" suffix.

## NPN Output Type

The numbers in white circles indicate the connector's pin numbers.
The black circles indicate connectors for series connection.
The words in brackets ([ ]) indicate the signal name for muting system.




## Single-end Connector Cable

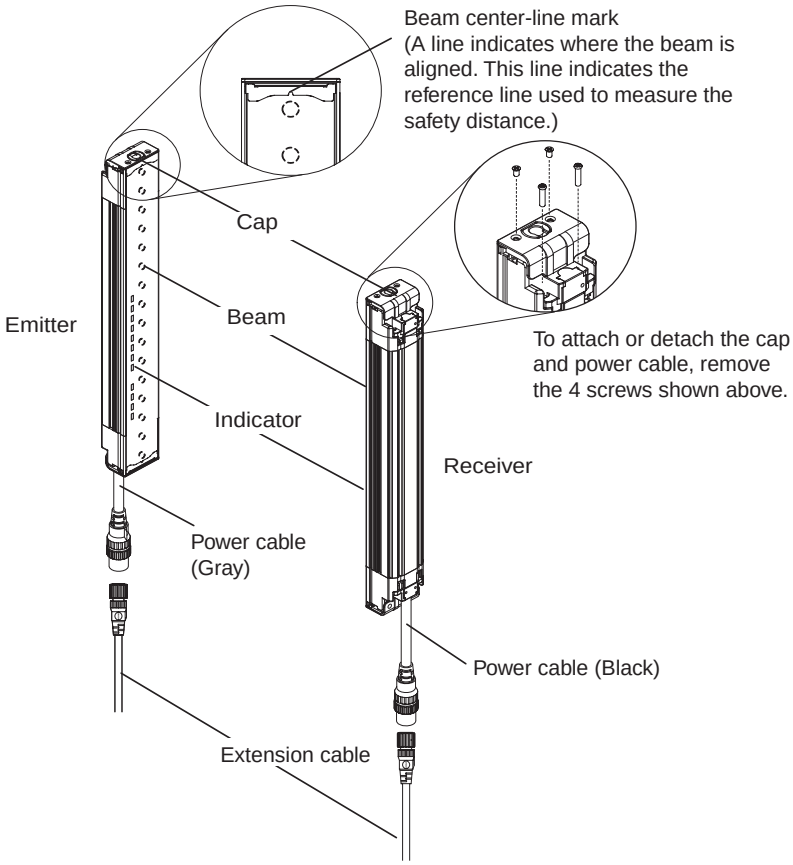
| Model | Internal wiring | Pin No. | Wire color | Signal Name | | | |
|---|---|---|---|---|---|---|---|
| | | | | Basic system ✻1 | | Muting system ✻1 | |
| | | | | Receiver | Emitter | Receiver | Emitter |
| F39-JCR5A (0.5 m)<br>F39-JC3A (3 m)<br>F39-JC7A (7 m)<br>F39-JC10A (10 m)<br>F39-JC15A (15 m) |  | (1) | White | Safety output 2 | Interlock selection input ✻2 | Safety output 2 | Muting input 1 |
| | | (2) | Brown | +24 VDC | +24 VDC | +24 VDC | +24 VDC |
| | | (3) | Green | Control output 1 | Test Input | Control output 1 | Test Input |
| | | (4) | Yellow | Auxiliary output 1 | Reset input | Auxiliary output 1 | Reset input |
| | | (5) | Gray | Communication line (+) | Communication line (+) | Communication line (+) | Communication line (+) |
| | | (6) | Pink | Communication line (-) | Communication line (-) | Communication line (-) | Communication line (-) |
| | | (7) | Blue | 0 V | 0 V | 0 V | 0 V |
| | | (8) | Red | External device monitoring input | Auxiliary output 2 ✻2 | External device monitoring input | Muting input 2 |

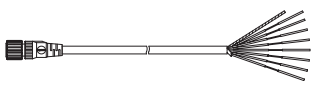


**✻1.** Basic system indicates a system with default factory settings.
Muting system indicates a system attached with a muting keycap (F39-CN6) to enable muting function.
**✻2.** N.C. for models with the "-TS" suffix.

# Nomenclature

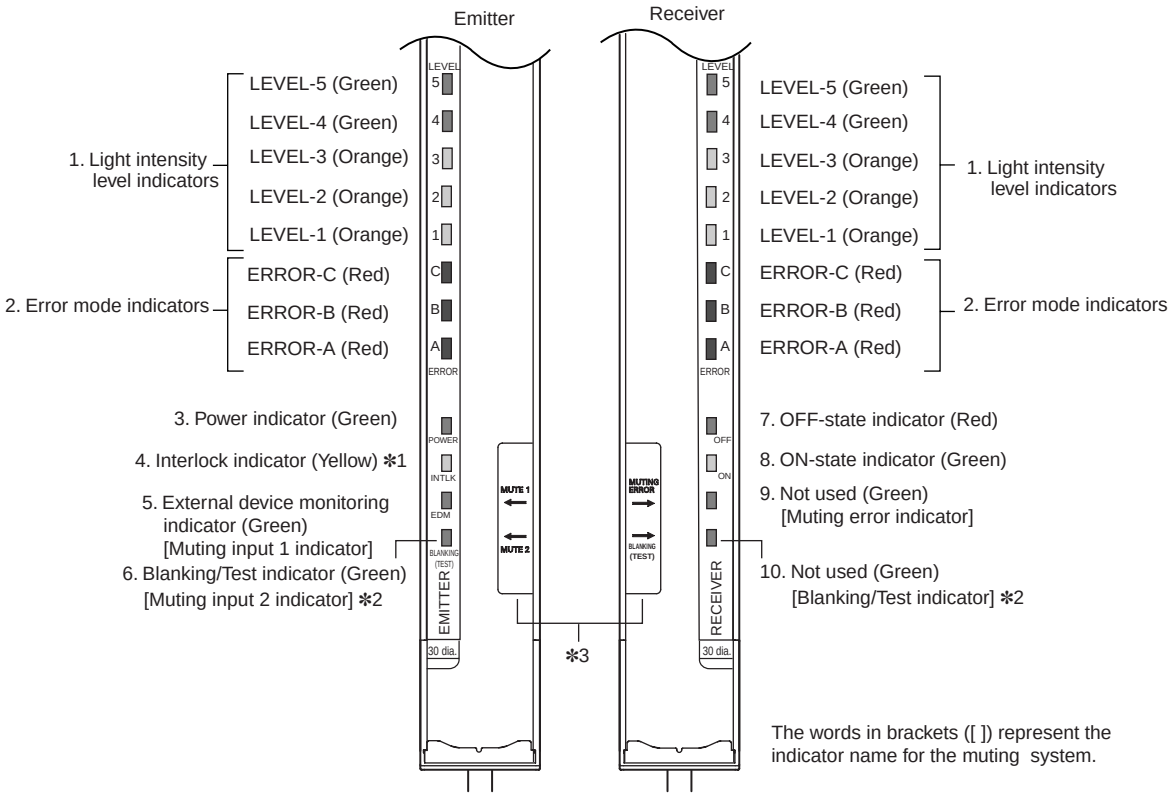
## Main Unit and Cables




| Component | | Model | Description |
|---|---|---|---|
| Emitter, receiver | | F3SJ-A□□□□P□□ or F3SJ-A□□□□N□□ | Select a type name based on the required protective height and detection capability.<br>(Cap and power cable are included)<br>The type name can be understood as follows:<br>F3SJ-A□□□□P□□-□<br>1 2 3 4<br>1: Protective height (mm)<br>2: Output type (P=PNP output type, N=NPN output type)<br>3: Diameter of detection capability (mm)<br>4: L is emitter, D is receiver, and a blank is emitter/receiver set. For models with fixed auto reset, the suffix "-L-TS" is an emitter, "-D-TS" is a receiver, and "-TS" is an emitter/receiver set. |
| Extension cable | Single-end connector cable  | F39-JC□A | This extension cable is used to connect to a terminal block controller (e.g. F3SX, G9SA, G9SB, G9SX) or to a safety processing system (e.g. DeviceNet safety). |
| | Double-end connector cable  | F39-JC□B | This extension cable is used when the length of the connection cable is insufficient, or when connecting to an F3SP-B1P controller. The length can be specified. |

## Internal Indicators

### Total View




| No. | Internal Indicators | | Description | |
|---|---|---|---|---|
| | | | For basic system | For muting system |
| 1 | Light intensity level indicators (LEVEL-1 to 5) (refer to page 312.) | ON | Indication status of LEVEL-1 to 5 shows the light intensity level status of the F3SJ. | |
| 2 | Error mode indicators (ERROR-A to C) (refer to page 312.) | ON/ Blinking | Turns ON or blinks only on the sensor where the error occurred when the F3SJ enters lockout. The error mode indicators turn OFF on sensors (emitters or receivers) where an error did not occur, or on other series-connected sensors. The indication status of ERROR-A to C shows the cause of the error. Affix the error mode label (included) near the F3SJ to allow for quick troubleshooting when errors occur. | |
| 3 | Power indicator (POWER) | ON | Turns ON while the power is ON. | |
| | | Blinking | Blinks when in maintenance mode. | |
| 4 | Interlock indicator (INTLK) ✻1 | ON | Turns ON when F3SJ is in interlock state. | |
| | | Blinking | Blinks when under lockout. | |
| 5 | External device monitoring indicator (EDM)<br>Muting input 1 indicator (MUTE1) | ON | Turns ON when an input is given to external device monitoring input. | Turns ON when an input is given to muting input 1. |
| | | Blinking | Not used | Blinks during muting override. |
| 6 | Blanking/Test indicator (BLANKING/TEST) ✻2<br>Muting input 2 indicator (MUTE2) | ON | Turns ON when the blanking function and warning zone function are enabled. | Turns ON when an input is given to muting input 2. |
| | | Blinking | Blinks when external test is being performed. | Blinks during muting override. |
| 7 | OFF output indicator (OFF) | ON | Turns ON when control output is OFF. | |
| | | Blinking | Blinks in the following states:<br>• Lockout state<br>• One or more beams are blocked in maintenance mode | |
| 8 | ON output indicator (ON) | ON | Turns ON when safety output is ON. | |
| | | Blinking | Blinks when no beams are blocked in maintenance mode | |
| 9 | Muting error indicator (MUTING ERROR) | ON | Not used | Turns ON when a muting error occurs. |
| 10 | Blanking/Test indicator (BLANKING/TEST) ✻2 | ON | Not used | Turns ON when the blanking function is enabled. |
| | | Blinking | Not used | Blinks when external test is being performed. |

**✻1.** Lockout indicator (LOCKOUT) for models with the "-TS" suffix.
**✻2.** In the TS model, this is a test indicator labeled TEST.
**✻3.** This label is included with the F39-CN6 key cap for muting. Affix the label when the muting function is used.

## Indication Patterns and Intensity Levels of the Light Intensity Level Indicators (LEVEL-1 to 5)



ON OFF

| 1 | 2 | 3 | 4 | 5 | Light intensity level |
|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | 170% or higher of control output ON level |
| ● | ● | ● | ● | ○ | From 130 to 170% of control output ON level |
| ● | ● | ● | ○ | ○ | From 100 to 130% of control output ON level |
| ● | ● | ○ | ○ | ○ | From 75 to 100% of control output ON level |
| ● | ○ | ○ | ○ | ○ | From 50 to 75% of control output ON level |
| ○ | ○ | ○ | ○ | ○ | Less than 50% of control output ON level |

**Note:** Operation is possible with light intensity level of 100% or more, but to ensure stability, operate when at least 5 of the indication lamps are ON.

## Error Mode Indication Patterns and Cause of Errors (ERROR-A to C)



OFF Blinking ON

| A | B | C | Cause of error |
|---|---|---|---|
| ● | ○ | ◐ | Mutual interference or ambient incident light. |
| ● | ◐ | ● | Power supply voltage of F3SJ is out of the rated range. Insufficient current capacity of power supply. |
| ● | ● | ○ | Incident light to blanking beams. |
| ● | ◐ | ○ | Failure in communication line. |
| ● | ◐ | ◐ | Emitter and receiver have different F3SJ type names or number of series connections. |
| ◐ | ◐ | ○ | Outside the effective range of parameters set by setting tool. |
| ◐ | ● | ● | Cap is not attached. |
| ○ | ◐ | ○ | External device monitor failure. |
| ◐ | ○ | ○ | Failure in interlock selection input line or reset input line. |
| ◐ | ● | ○ | Muting wiring failure. |
| ○ | ○ | ◐ | Failure in control output wiring. |
| ○ | ◐ | ◐ | Failure in series connection cable wiring. |
| ○ | ● | ◐ | Failure in wiring of external display lamp output. |
| ● | ● | ◐ | Failure in wiring of auxiliary output. |
| ◐ | ○ | ◐ | Broken series connection cable. |
| ● | ○ | ○ | Wiring error or broken communications wire. |
| ◐ | ◐ | ◐ | Influence of electrical noise, or failure in a series-connected F3SJ. |

# Safety-related Functions

## Interlock Function

The F3SJ turns the safety outputs OFF when the power is turned ON or when a beam is interrupted, and maintains this state until a reset signal is applied. This state is called "interlock".
You can reset this interlock by 2 methods; “auto reset that automatically turns safety output ON when an interrupting object is removed” and “manual reset mode that keeps safety output OFF until a reset signal is provided if the interrupting object is removed”.

### Auto Reset Mode

When an interrupting object is removed, safety output automatically turns ON. Auto reset is used on machines where a worker is not able to enter the area between the detection zone and the hazardous part of the machine.

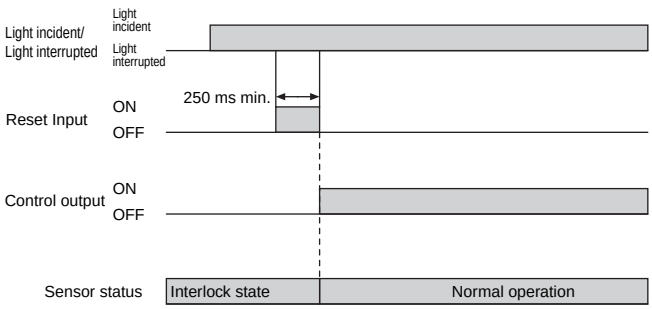
**Note:** Auto reset is always used in the F3SJ-A□-TS series.

**Auto reset wiring procedure:**

| For PNP output | For NPN output |
|---|---|
| **1.** Open the interlock selection input line, or short-circuit it to 0 to 1.5 V (pin 1/white).<br>**2.** Short-circuit the reset input line to 9 to 24 V (pin 4/yellow).<br>**3.** Turn ON the power of F3SJ. | **1.** Open the interlock selection input line, or short-circuit it to 9 to 24 V (pin 1/white).<br>**2.** Short-circuit the reset input line to 0 to 1.5 V (pin 4/yellow).<br>**3.** Turn ON the power of F3SJ. |

### Manual Reset Mode

When a reset input is given while no interrupting object exists in a detection zone, the safety outputs turn ON. This allows the machine to be manually reset using a reset switch after ensuring safety, preventing unexpected startup.




A sensor enters interlock state when:

- The power is turned ON (start interlock). This is useful if you want to keep the machine stopped until start inspection is completed after the power is turned ON.
- F3SJ is interrupted (restart interlock). After F3SJ is interrupted and the machine stops, the machine can be restarted after safety is ensured.

**Manual Reset Wiring Procedure:**

| For PNP output | For NPN output |
|---|---|
| **1.** Connect the interlock selection input line to 9 to 24 V (pin 1/white).<br>**2.** Connect the reset input line to 9 to 24 V via the reset switch (NO-contact) (pin 4/yellow).<br>**3.** Keep the reset switch contact open, and turn the power of F3SJ ON. | **1.** Connect the interlock selection input line to 0 to 1.5 V (pin 1/white).<br>**2.** Connect the reset input line to 0 to 1.5 V via the reset switch (NO-contact) (pin 4/yellow).<br>**3.** Keep the reset switch contact open, and turn the power of F3SJ ON. |

**To reset:**

| For PNP output | For NPN output |
|---|---|
| Apply voltage of 9 to 24 V for 250 ms or longer to the reset input line, and set it open or to 0 to 1.5 V. | Apply voltage of 0 to 1.5 V for 250 ms or longer to the reset input line, and set it open or to 9 to 24 V. |

**Note:** Install the reset switch outside the hazardous area, where the operator can clearly see the hazardous area.

### Interlock Function in a Muting System

Because the interlock selection input line is used as muting input 1 when using the muting function, the default setting is auto reset. Use a setting tool for manual reset.

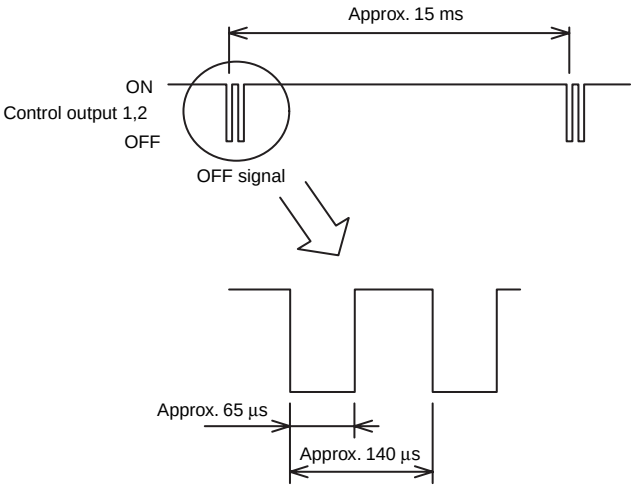
# Diagnostic Functions

## Self-test

A self-test is performed to check for errors when the power is turned ON (within 2 seconds / within 2.2 seconds when series connected). Also, the self-test is regularly performed (within the response time) while operating.

## Waveform of Control Outputs

When the F3SJ is receiving light, the control outputs cyclically turn OFF as shown below to test the output circuit. When this OFF signal is fed back, the output circuit is diagnosed as normal. If the output signal does not include an OFF pulse signal, the receiver determines that a failure has occurred with the output circuit or wiring, and enters lockout state. (Refer to the following illustration.)




## External Test

This function performs a test to ensure that the safety system stops properly when the F3SJ is interrupted, by using an external signal to forcibly stop emission.
To stop emission, apply 9 to 24 V for PNP output types or 0 to 1.5 V for NPN output types to the test input line of the emitter. Apply the voltage for a minimum of 4 x the safety output response time.

## Lockout

If an error is found in the self-test, the sensor enters lockout state, keeps the safety output in the OFF state, and indicates the error at the same time.

## Resetting Lockout

When a cause of lockout is removed, you can release the lockout by using either of the following methods.

- Cycle the power back ON
- Reset input

**[For PNP output]**
After manual reset, apply voltage of 9 to 24 V for 100 ms or longer to the reset input line, and set it open or apply 0 to 1.5 V.
After auto reset, apply voltage of 0 to 1.5 V for 100 ms or longer to the reset input line, and set it open or apply 9 to 24 V.

**[For NPN output]**
After manual reset, apply voltage of 0 to 1.5 V for 100 ms or longer to the reset input line, and set it open or apply 9 to 24 V.
After auto reset, apply voltage of 9 to 24 V for 100 ms or longer to the reset input line, and set it open or apply 0 to 1.5 V.

## External Device Monitoring Function

This function detects malfunctions, such as welded contacts in external relays (or contactors) that control the hazardous area of a machine.
This function constantly monitors that a specified voltage is applied to the receiver's external device monitoring input line, and enters lockout state when an error occurs. The relay's operational delay can be up to 300 ms without being evaluated as an error.
For example, if a specified voltage is not applied to the external device monitoring line because the normally closed (NC) contact is not closed within 300 ms after the control outputs turn from ON to OFF, it is evaluated as an error and enters a lockout state.
To utilize this function properly, use safety relays and contactors that have forcibly guided or mechanically linked contact structure.

# Other Functions

## Auxiliary Output (Non-safety output)

The auxiliary output is used to monitor the status of the F3SJ.
This output can be connected to a device such as a relay, indication lamp, programmable controller, etc.
There are two auxiliary outputs: Auxiliary output 1 and auxiliary output 2.

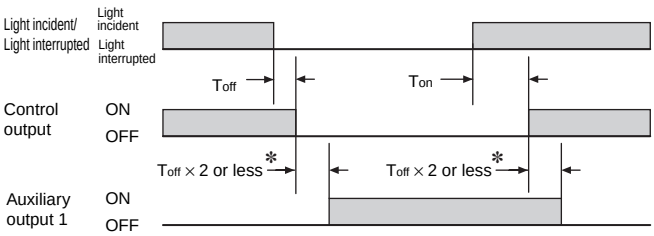
- Auxiliary output 1: Control output inversion signal
- Auxiliary output 2: Turns ON when the point of 30,000 operating hours is reached

The auxiliary output modes can be changed with a setting tool. See the User's Manual for details on the modes that can be set.

**⚠ WARNING**

Do not use the auxiliary output or external indicator output for safety applications.
Failure of these outputs may prevent detection of people and result in serious injury.

**Note: 1.** Auxiliary output 1 has a load current of 300 mA max., and auxiliary output 2 has a load current of 50 mA.
**2.** The timing when auxiliary output 1 is set as a control output inversion signal is shown in the diagram below.

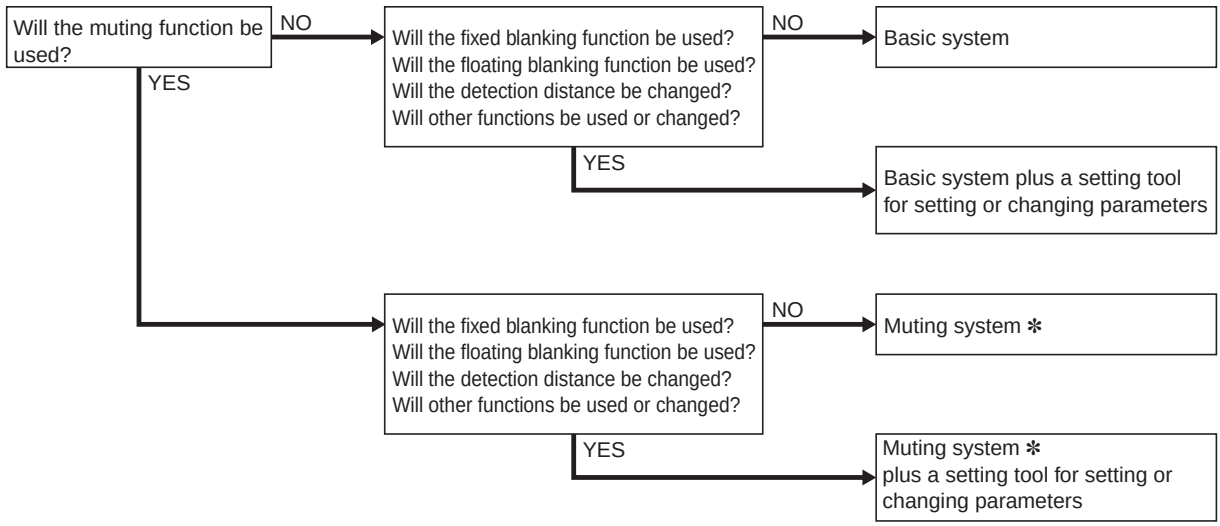



Toff: Response time of control output's ON to OFF, Ton: Response time of control output's OFF to ON
✻ When auxiliary output 2 is set as a control output inversion signal, the response delay for control output becomes Toff x 3 max.

# Selecting the System Configuration

## Selection Flowchart

The necessary system configuration varies depending on the functions to be used.
Use the following flowchart to decide what kind of system is required.




✻ F39-CN6 Key Cap for muting is required.

**Note:** Refer to the User's Manual to determine whether the functions can be used in combination or not.

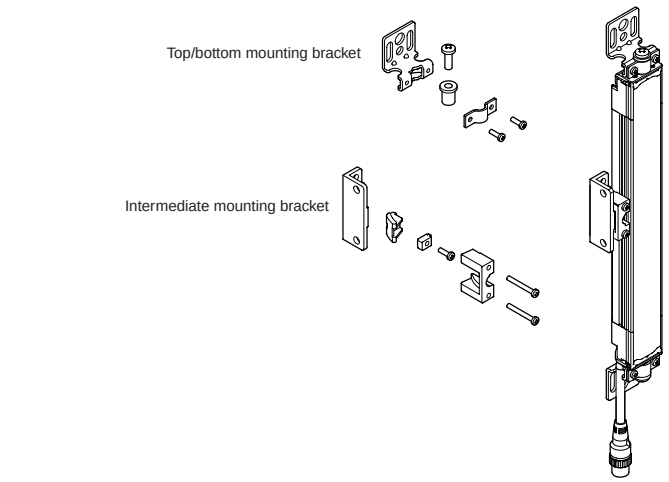
# Dimensions

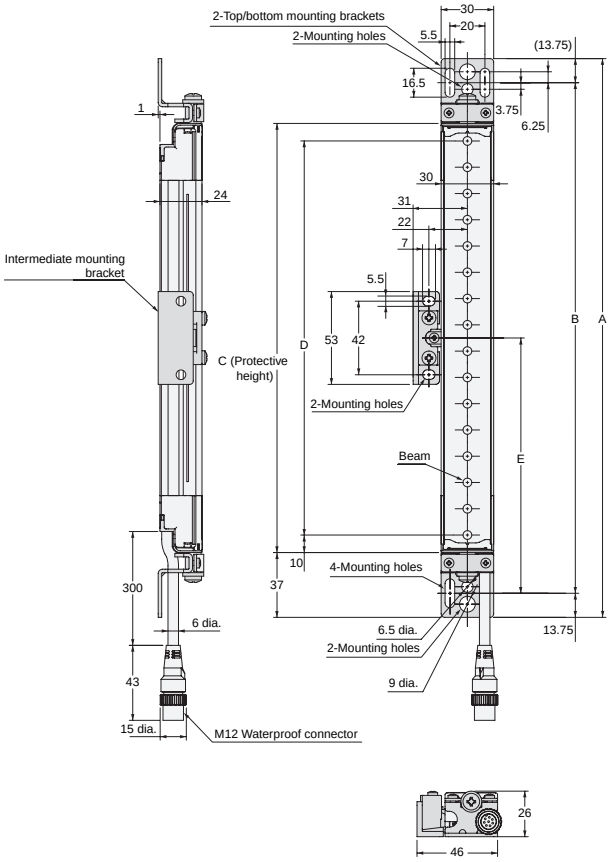
(Unit: mm)

## Main Units

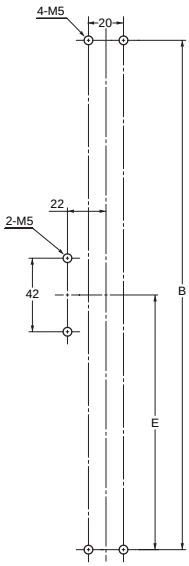
### When Using Standard Mounting Brackets

**Backside mounting**




Mounting screw holes

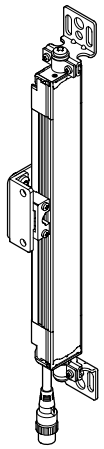


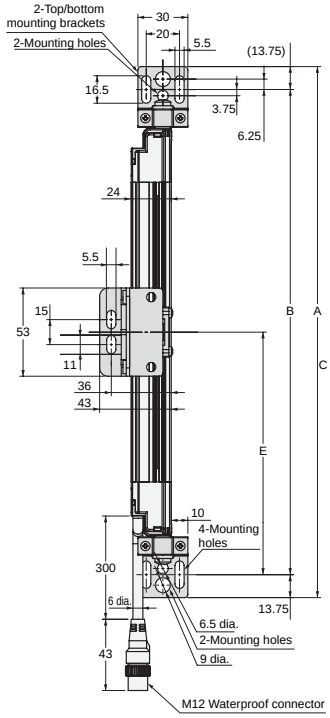

C (protective height): 4-digit number in the table
A = C + 74, B = C + 46.5
D = C - 20, E = See table below.

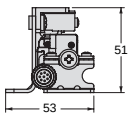
| Protective height | Number of intermediate brackets | E ✻ |
|---|---|---|
| 0245 to 0596 | 0 | --- |
| 0600 to 1130 | 1 | E = B / 2 |
| 1136 to 1658 | 2 | E = B / 3 |
| 1660 to 2180 | 3 | E = B / 4 |
| 2195 to 2500 | 4 | E = B / 5 |

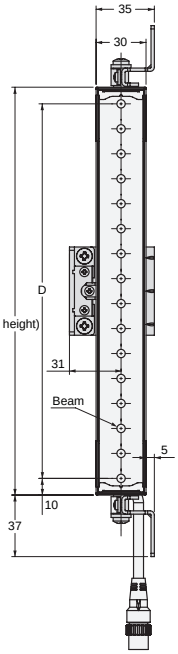
✻ Use E = 530 or less when none of the E values shown above are used.

## Side mounting

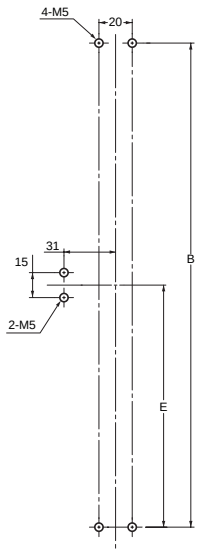





Mounting screw holes

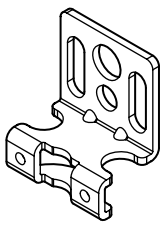


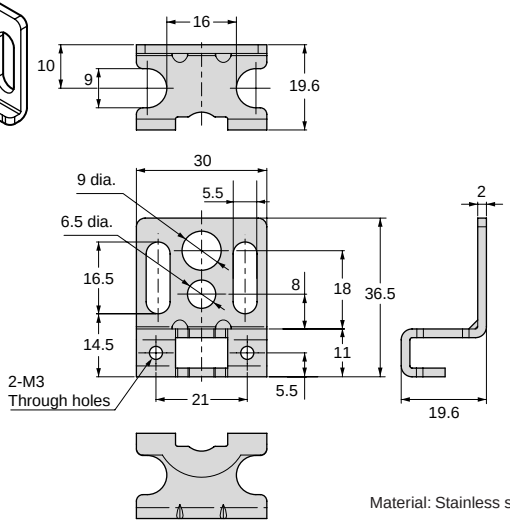

C (protective height): 4-digit number in the table
A = C + 74, B = C + 46.5
D = C - 20, E = See table below.

| Protective height | Number of intermediate brackets | E ✻ |
|---|---|---|
| 0245 to 0596 | 0 | --- |
| 0600 to 1130 | 1 | E = B / 2 |
| 1136 to 1658 | 2 | E = B / 3 |
| 1660 to 2180 | 3 | E = B / 4 |
| 2195 to 2500 | 4 | E = B / 5 |

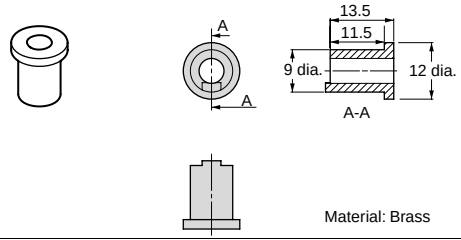
✻ Use E = 530 or less when none of the E values shown above are used.

## F39-LJ1 Detailed Dimensions of Bracket

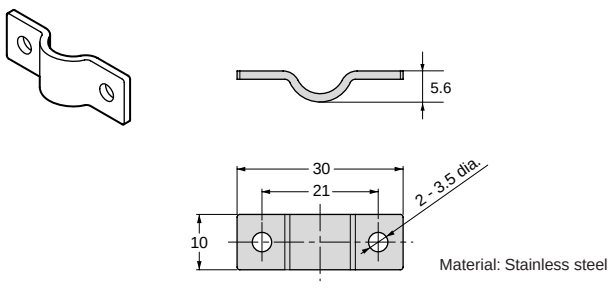





Material: Stainless steel



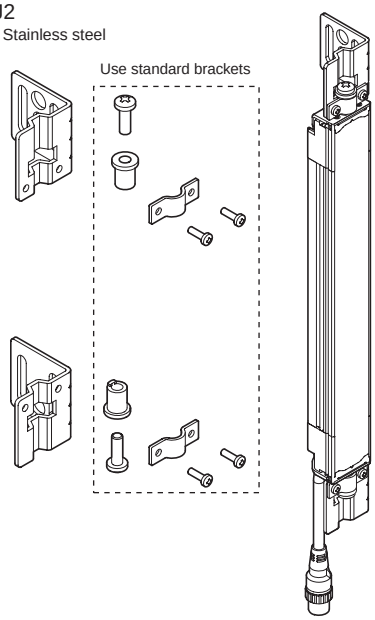

Material: Brass

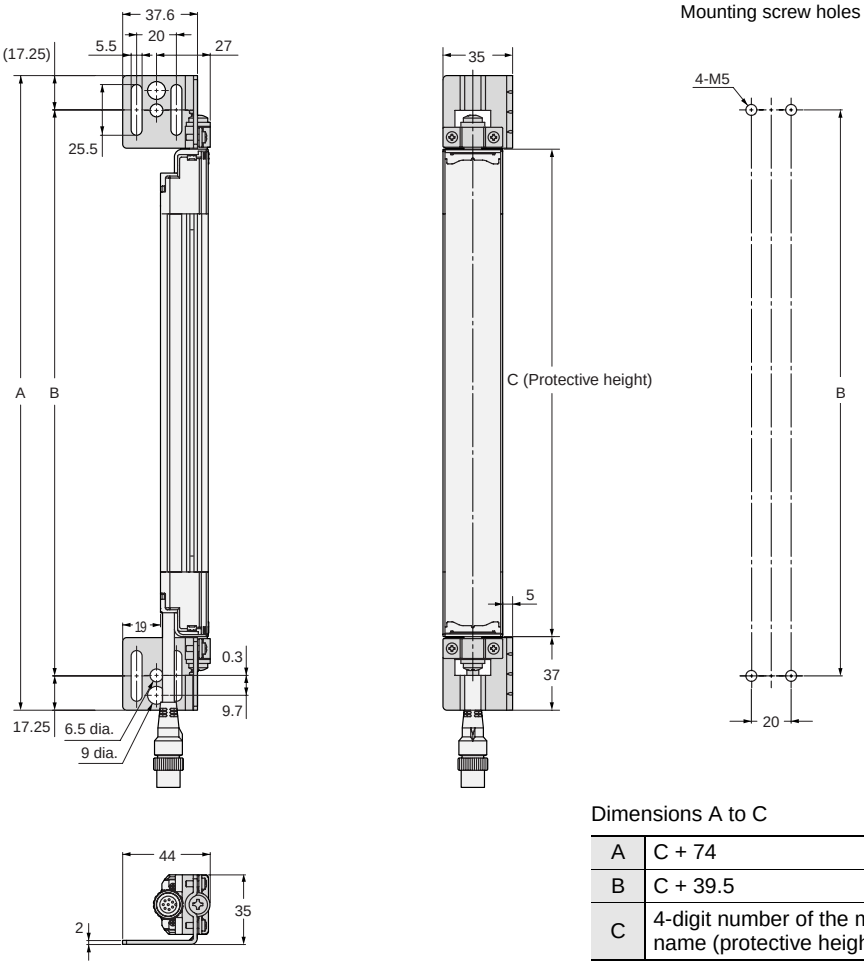



Material: Stainless steel

## Using Side Flat Mounting Bracket (F39-LJ2)

F39-LJ2
Material: Stainless steel



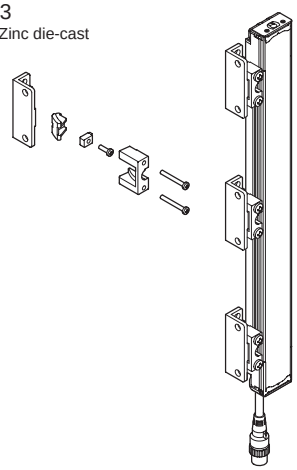

Dimensions A to C

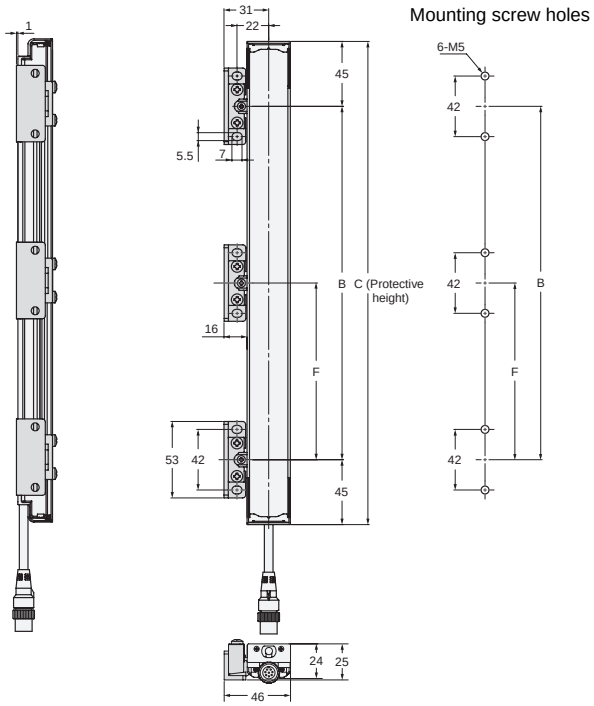
| | |
|---|---|
| A | C + 74 |
| B | C + 39.5 |
| C | 4-digit number of the model name (protective height) |

## Using Free Location Mounting Bracket (F39-LJ3)

### Backside mounting

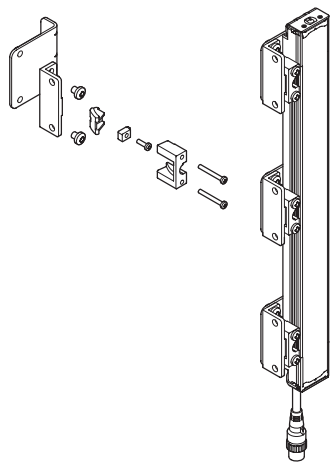
F39-LJ3
Material: Zinc die-cast

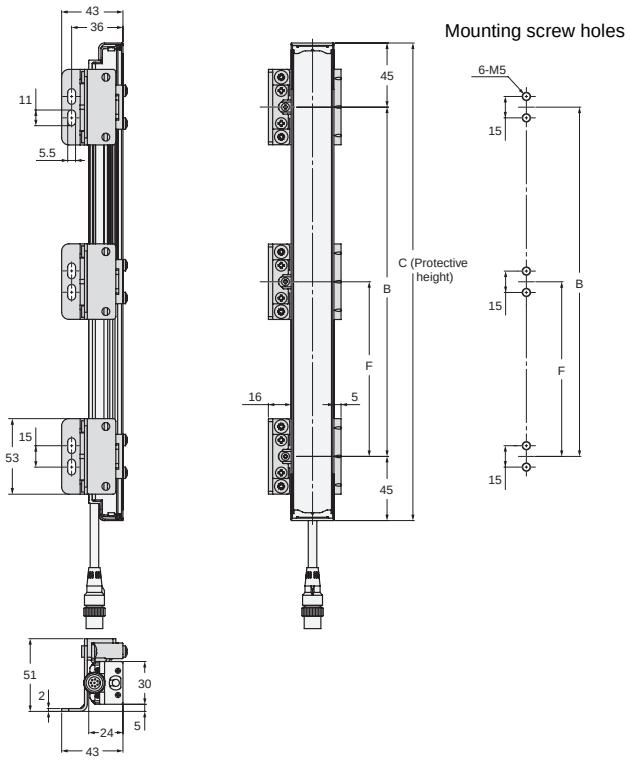





### Side mounting

F39-LJ3
Material: Zinc die-cast/stainless





### Dimensions B, C, and F

| | |
|---|---|
| B | C - 90 |
| C | 4-digit number of the model name (protective height) |
| F | Depends on the protective height. See the table on the right. |

### Dimension F

| Protective height | Number of intermediate mounting brackets | F ✻ |
|---|---|---|
| 245 to 440 | 2 | --- |
| 443 to 785 | 3 | B / 2 |
| 794 to 1140 | 4 | B / 3 |
| 1145 to 1490 | 5 | B / 4 |
| 1495 to 1840 | 6 | B / 5 |
| 1845 to 2180 | 7 | B / 6 |
| 2195 to 2500 | 8 | B / 7 |

✻ Use F = 350 or less when none of the F values shown above are used.

When only F39-LJ3 free-location mounting brackets are used without standard brackets, allow a space of at least 350 mm between the brackets. The number of brackets required varies according to the protective height. For details about the number of required brackets, refer to the table below.

The standard included intermediate mounting brackets are the same as the F39-LJ3 free-location mounting brackets. Purchase brackets as necessary if there are fewer intermediate mounting brackets than required. When intermediate mounting brackets are included, they can be used as free-location mounting brackets.

### Required number of F39-LJ3 free-location mounting brackets for 1 F3SJ set (emitter/receiver) (2 pieces are included with F39-LJ3)

| Protective height | Number of included free location brackets as intermediate brackets | Number of free location brackets to mount F3SJ | Number of free location brackets to be purchased |
|---|---|---|---|
| 0245 to 0440 | 0 | 4 | 2 sets |
| 0443 to 0596 | 0 | 6 | 3 sets |
| 0600 to 0785 | 2 | 6 | 2 sets |
| 0794 to 1130 | 2 | 8 | 3 sets |
| 1136 to 1140 | 4 | 8 | 2 sets |
| 1145 to 1490 | 4 | 10 | 3 sets |
| 1495 to 1658 | 4 | 12 | 4 sets |
| 1660 to 1840 | 6 | 12 | 3 sets |
| 1845 to 2180 | 6 | 14 | 4 sets |
| 2195 to 2500 | 8 | 16 | 4 sets |

# Guide to Replacing F3SN Models with F3SJ Models

## F3SN replacement correspondence table (F3SN mounting holes can be used without modification)

**When replacing F3SN-□□□□P(N)14 with F3SJ-A□□□□P(N)14**

**(1) For F3SN models with a protective height of 225 mm max.**

| F3SN | | Replacement F3SJ | | Replacement method using F39-LJ5 |
|---|---|---|---|---|
| Model | Protective height | Model | Protective height | |
| F3SN-□0153P(N)14 | 153 | --- | --- | --- |
| F3SN-□0180P(N)14 | 180 | F3SJ-A0245P(N)14 | 245 | Inward-facing mounting |
| F3SN-□0189P(N)14 | 189 | F3SJ-A0245P(N)14 | 245 | Inward-facing mounting |
| F3SN-□0198P(N)14 | 198 | F3SJ-A0245P(N)14 | 245 | Inward + outward-facing mounting |
| F3SN-□0207P(N)14 | 207 | F3SJ-A0245P(N)14 | 245 | Inward + outward-facing mounting |
| F3SN-□0216P(N)14 | 216 | F3SJ-A0245P(N)14 | 245 | Outward-facing mounting |
| F3SN-□0225P(N)14 | 225 | F3SJ-A0245P(N)14 | 245 | Outward-facing mounting |

**(2) For F3SN models with a protective height of 234 mm min.**

Add 11 to the F3SN's 4-digit number and apply it as the F3SJ's 4-digit number, and then replace with the standard brackets included with the product.
[Selection example] F3SN-A0315P(N)14 becomes F3SJ-A0326P(N)14 (replace with standard brackets)

**Note: 1.** The protective height becomes 11 mm longer.
**2.** Replace with outward-facing mounting of F39-LJ5 when you want to set the detection surface height to be same as the F3SN. However, the F39-LJ5 and intermediate mounting brackets cannot be mounted simultaneously, so set the protective height to 600 mm or less.

**When replacing F3SN-□□□□P (N)25 with F3SJ-A□□□□P (N)20**

**(1) For F3SN models with a protective height of 247 mm max.**

| F3SN | | Replacement F3SJ | | Replacement method using F39-LJ5 |
|---|---|---|---|---|
| Model | Protective height | Model | Protective height | |
| F3SN-□0187P(N)25 | 187 | --- | --- | --- |
| F3SN-□0217P(N)25 | 217 | F3SJ-A0260P(N)20 | 260 | Inward-facing mounting |
| F3SN-□0232P(N)25 | 232 | F3SJ-A0260P(N)20 | 260 | Inward + outward-facing mounting |
| F3SN-□0247P(N)25 | 247 | F3SJ-A0245P(N)20 | 245 | Outward-facing mounting |

**(2) For F3SN models with a protective height of 262 mm min.**

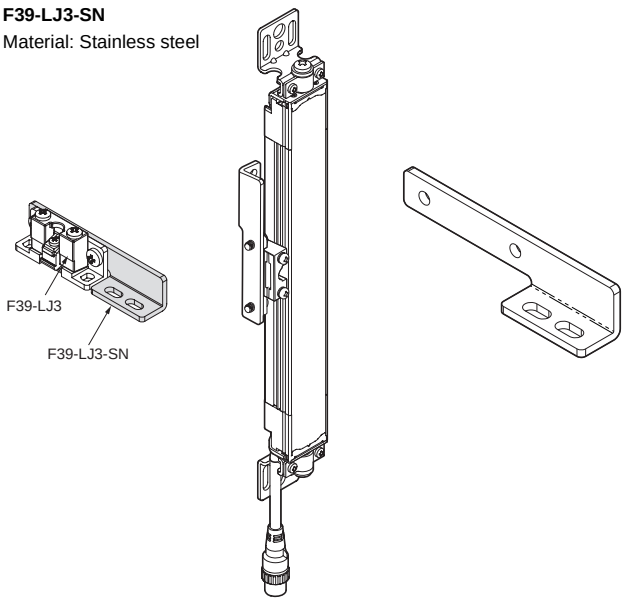
Subtract 17 from the F3SN's 4-digit number and apply it as the F3SJ's 4-digit number, and then replace with the standard brackets included with the product.
[Selection example] F3SN-A0322P(N)25 becomes F3SJ-A0305P(N)20 (replace with standard brackets)

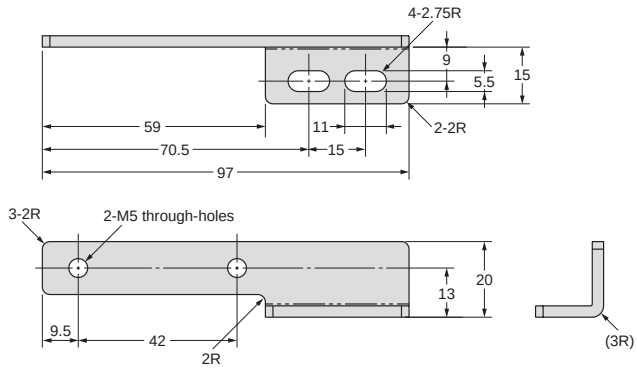
**Note: 1.** The protective height gets 17 mm shorter.
**2.** Replace with outward-facing mounting of F39-LJ5 when you want to set the detection surface height to be same as the F3SN. However, the F39-LJ5 and intermediate mounting brackets cannot be mounted simultaneously, so set the protective height to 600 mm or less.

## When using intermediate mounting brackets to replace a rear mounted F3SN with an F3SJ

Because the pitch of the mounting holes for the intermediate mounting brackets are different (F3SN: 15 mm, F3SJ: 42 mm), use F39-LJ3-SN Spacers for F3SN intermediate mounting bracket replacement.

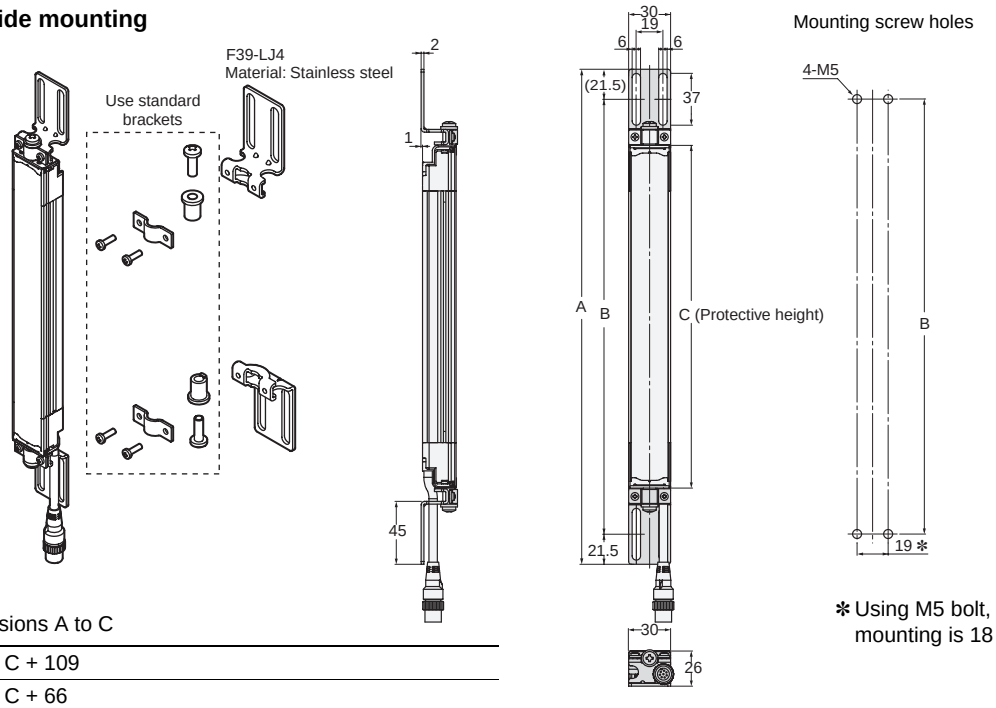
**F39-LJ3-SN**
Material: Stainless steel



## Using Top/Bottom Mounting Bracket B (F39-LJ4)

### Backside mounting




✻ Using M5 bolt, available range for mounting is 18 to 20.

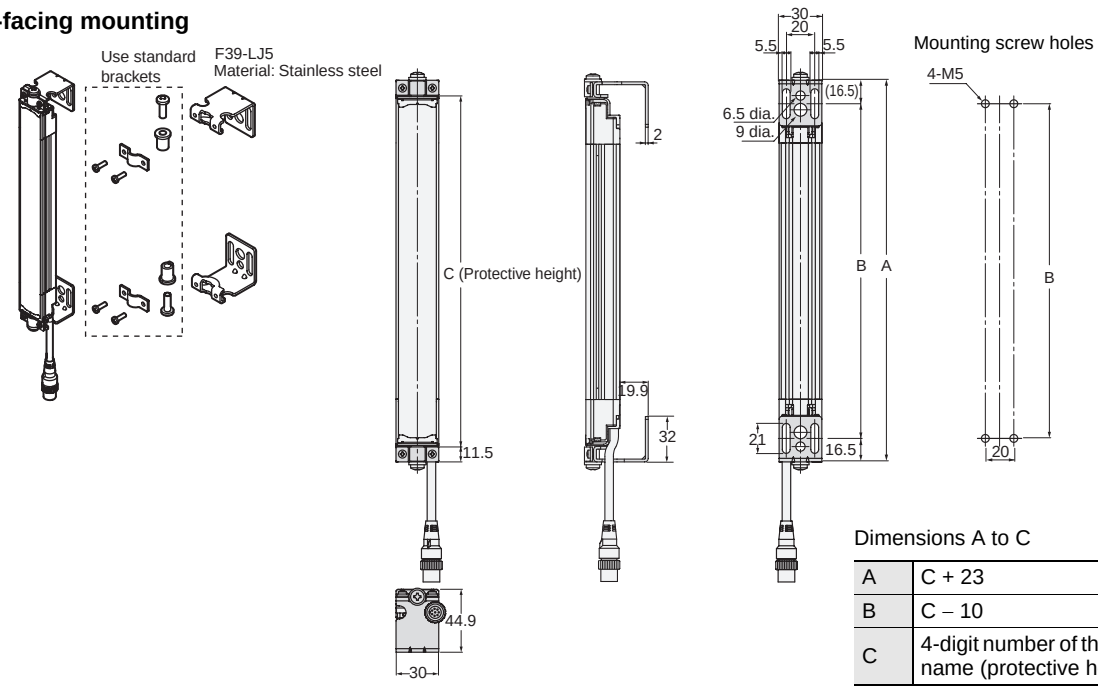
Dimensions A to C

| | |
|---|---|
| A | C + 109 |
| B | C + 66 |
| C | 4-digit number of the model name (protective height) |

**Note:** Refer to the *User's Manual* (Cat. No. SCHG-718 and SCHG-719) for the dimensions for side mounting.

## Using Mounting Bracket for Short-length F3SN (F39-LJ5)

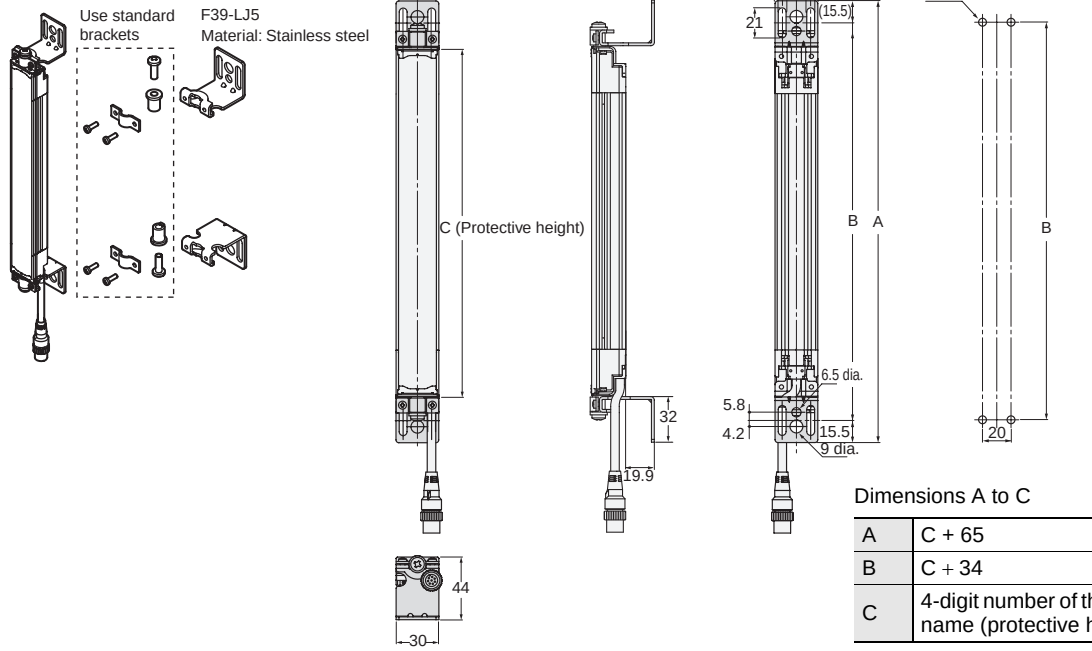
### Inward-facing mounting




Dimensions A to C

| | |
|---|---|
| A | C + 23 |
| B | C − 10 |
| C | 4-digit number of the model name (protective height) |

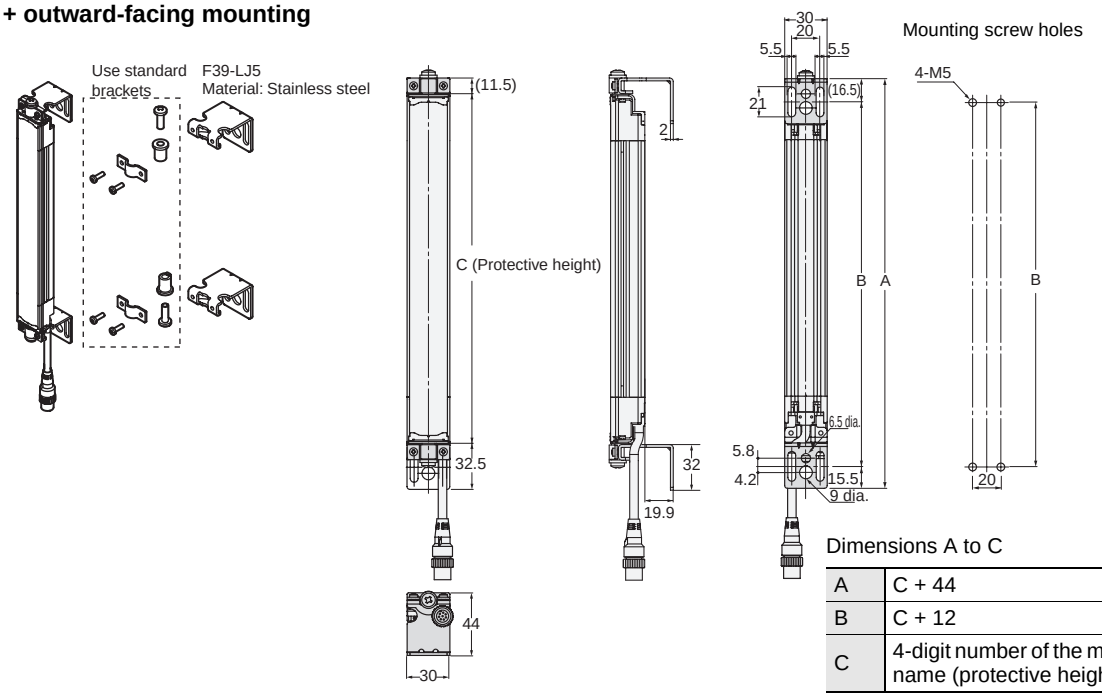
## Outward-facing mounting




Dimensions A to C

| | |
|---|---|
| A | C + 65 |
| B | C + 34 |
| C | 4-digit number of the model name (protective height) |

## Inward + outward-facing mounting




Dimensions A to C

| | |
|---|---|
| A | C + 44 |
| B | C + 12 |
| C | 4-digit number of the model name (protective height) |

**F3SN replacement correspondence table (F3SN mounting holes can be used without modification)**

**When replacing F3SN-□□□□P(N)14 with F3SJ-A□□□□P(N)14**

| F3SN | | Replacement F3SJ | | Replacement method using F39-LJ5 |
|---|---|---|---|---|
| Model | Protective height | Model | Protective height | |
| F3SN-□0153P(N)14 | 153 | --- | --- | --- |
| F3SN-□0180P(N)14 | 180 | F3SJ-A0245P(N)14 | 245 | Inward-facing mounting |
| F3SN-□0189P(N)14 | 189 | F3SJ-A0245P(N)14 | 245 | Inward-facing mounting |
| F3SN-□0198P(N)14 | 198 | F3SJ-A0245P(N)14 | 245 | Inward + Outward-facing mounting |
| F3SN-□0207P(N)14 | 207 | F3SJ-A0245P(N)14 | 245 | Inward + Outward-facing mounting |
| F3SN-□0216P(N)14 | 216 | F3SJ-A0245P(N)14 | 245 | Outward-facing mounting |
| F3SN-□0225P(N)14 | 225 | F3SJ-A0245P(N)14 | 245 | Outward-facing mounting |

**For F3SN models with a protective height of 234 mm min.**
Add 11 to the F3SN's 4-digit number and apply it as the F3SJ's 4-digit number, and then replace with the standard brackets included with the product.
[Selection example] F3SN-A0315P(N)14 becomes F3SJ-A0326P(N)14 (replace with standard brackets)

**Note:** **1.** The protective height becomes 11 mm longer.
**2.** Replace with outward-facing mounting of F39-LJ5 when you want to set the detection surface height to be same as the F3SN. However, the F39-LJ5 and intermediate mounting brackets cannot be mounted simultaneously, so set the protective height to 600 mm or less.

**When replacing F3SN-□□□□P(N)25 with F3SJ-A□□□□P(N)20**

| F3SN | | Replacement F3SJ | | Replacement method using F39-LJ5 |
|---|---|---|---|---|
| Model | Protective height | Model | Protective height | |
| F3SN-□0187P(N)25 | 187 | --- | --- | --- |
| F3SN-□0217P(N)25 | 217 | F3SJ-A0260P(N)20 | 260 | Inward-facing mounting |
| F3SN-□0232P(N)25 | 232 | F3SJ-A0260P(N)20 | 260 | Inward + Outward-facing mounting |
| F3SN-□0247P(N)25 | 247 | F3SJ-A0245P(N)20 | 245 | Outward-facing mounting |

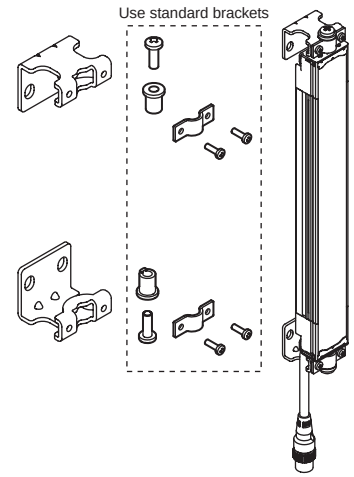
**For F3SN models with a protective height of 262 mm min.**
Subtract 17 from the F3SN's 4-digit number and apply it as the F3SJ's 4-digit number, and then replace with the standard brackets included with the product.
[Selection example] F3SN-A0322P(N)25 becomes F3SJ-A0305P(N)20 (replace with standard brackets)

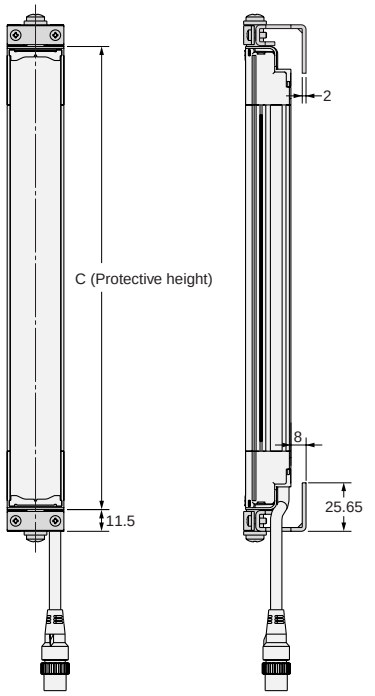
**Note:** **1.** The protective height becomes 17 mm shorter.
**2.** Replace with outward-facing mounting of F39-LJ5 when you want to set the detection surface height to be same as the F3SN. However, the F39-LJ5 and intermediate mounting brackets cannot be mounted simultaneously, so set the protective height to 600 mm or less.

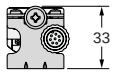
## Using Space-saving Mounting Bracket (F39-LJ8)

### Backside mounting

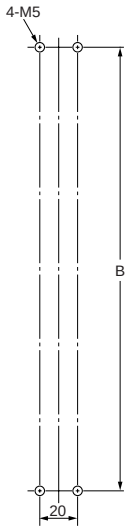
F39-LJ8
Material: Stainless steel




Mounting screw holes




Dimensions A to C

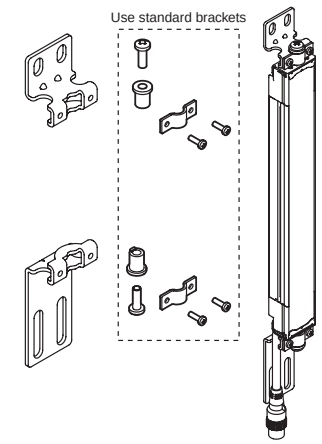
| | |
|---|---|
| A | C + 23 |
| B | C − 10.3 |
| C | 4-digit number of the model name (protective height) |

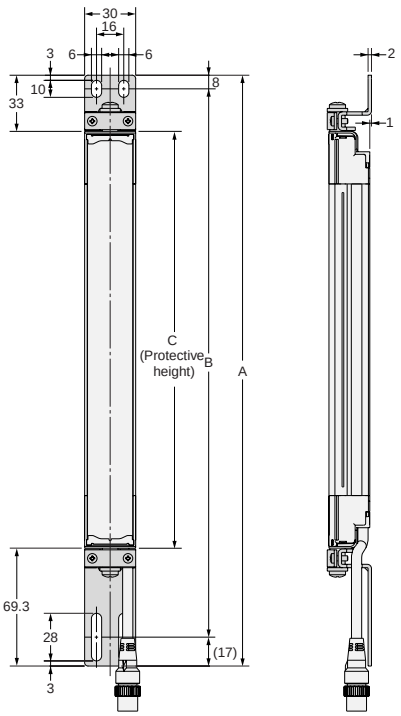
**Note:** Because the F39-LJ8 cannot be mounted together with an intermediate bracket, keep the protective height at 600 mm max.

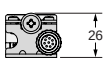
## Mounting Bracket (F39-LJ9) Used when Replacing an F3W-C.

### Backside mounting

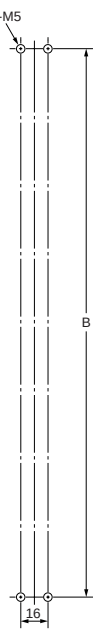
F39-LJ9
Material: Stainless steel




Mounting screw holes




Dimensions A to C

| | |
|---|---|
| A | C + 102.3 |
| B | C + 77.3 |
| C | 4-digit number of the model name (protective height) |

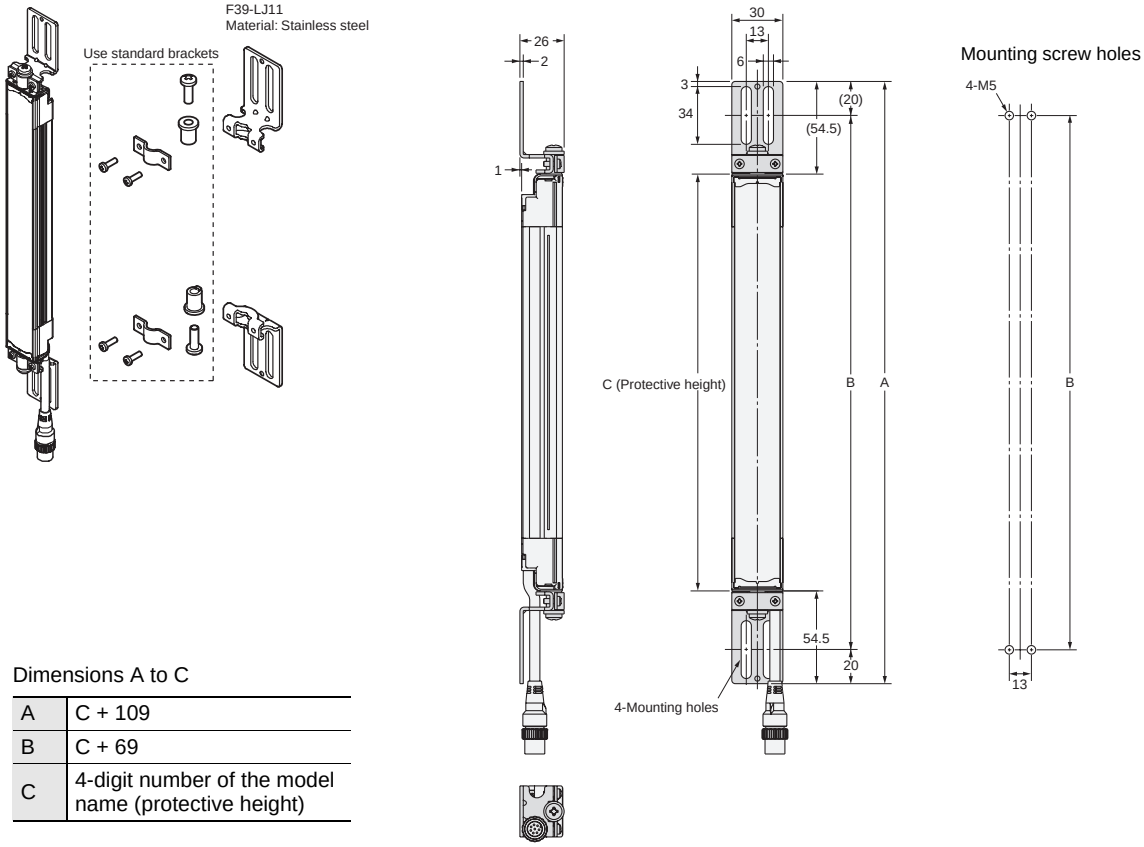
**Note:** Refer to the *User's Manual* (Cat. No. SCHG-718 and SCHG-719) for the dimensions for side mounting.

**F3W-C replacement correspondence table (F3W-C mounting holes can be used without modification)**
**When replacing F3W-C□□□ with F3SJ-A□□□□□30**

| F3W-C | | Replacement F3SJ | |
|---|---|---|---|
| Model | Protective height | Model | Protective height |
| F3W-C044 | 120 | --- | --- |
| F3W-C084 | 280 | F3SJ-A0320□30 | 320 |
| F3W-C124 | 440 | F3SJ-A0470□30 | 470 |
| F3W-C164 | 600 | F3SJ-A0620□30 ✻ | 620 |
| F3W-C204 | 760 | F3SJ-A0795□30 ✻ | 795 |
| F3W-C244 | 920 | F3SJ-A0945□30 ✻ | 945 |

✻ New holes must be drilled for the intermediate bracket.

## Using Top/Bottom Mounting Bracket C (F39-LJ11)




Dimensions A to C

| | |
|---|---|
| A | C + 109 |
| B | C + 69 |
| C | 4-digit number of the model name (protective height) |

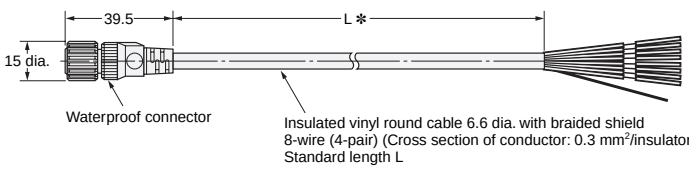
# Accessories

## Single-end Connector Cable

**F39-JCR5A (L=0.5 m)** **F39-JC10A (L = 10 m)**
**F39-JC3A (L = 3 m)** **F39-JC15A (L = 15 m)**
**F39-JC7A (L = 7 m)** **F39-JC20A (L = 20 m)**



Color: Emitter (gray)
Receiver (black)

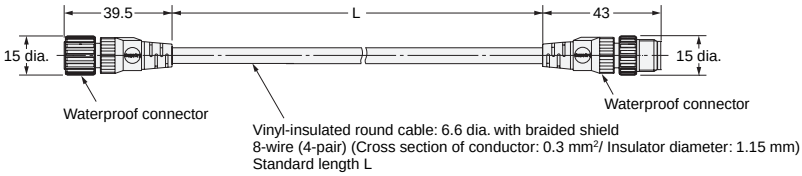



✻ Cables with L=3, 7, 10, 15, and 20 m are available.

## Cables with Connectors on Both Ends

**F39-JCR5B (L = 0.5 m)**
**F39-JC1B (L = 1 m)**
**F39-JC3B (L = 3 m)**
**F39-JC5B (L = 5 m)**
**F39-JC7B (L = 7 m)**
**F39-JC10B (L = 10 m)**
**F39-JC15B (L = 15 m)**
**F39-JC20B (L = 20 m)**
**F39-JC30B (L = 30 m)**
**F39-JC40B (L = 40 m)**



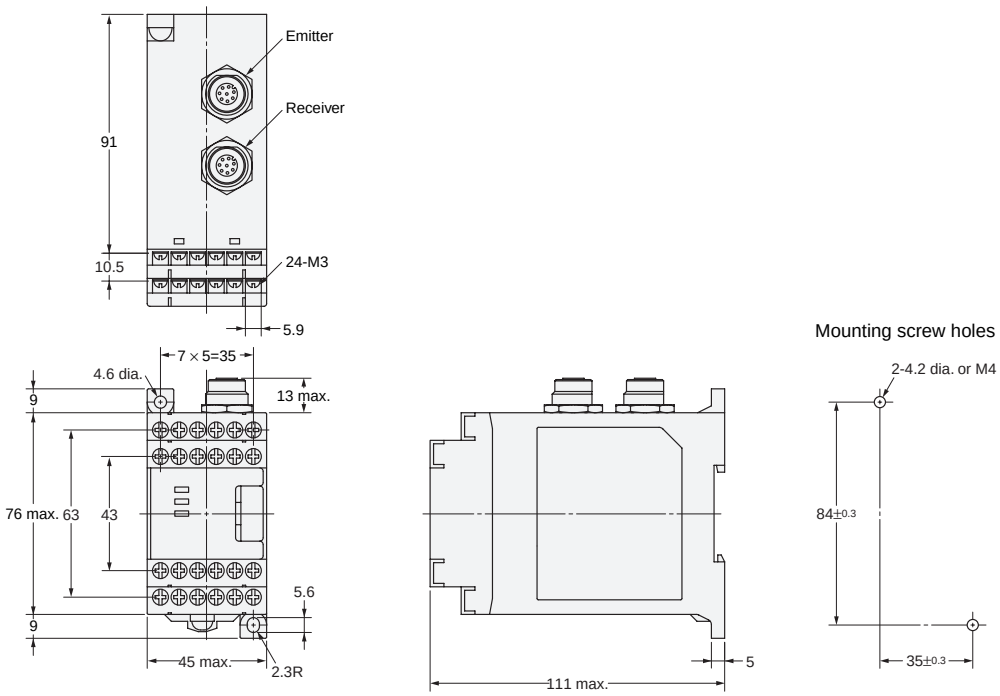



Color: Emitter (gray)
Receiver (black)

## Control Unit

**F3SP-B1P**

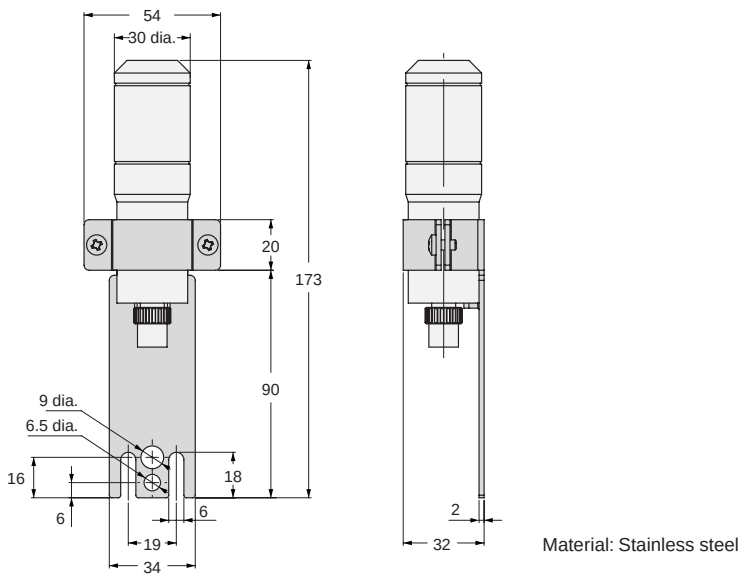





## Dedicated External Indicator Set

**F39-A01□-PAC**

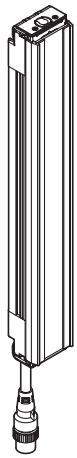


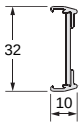


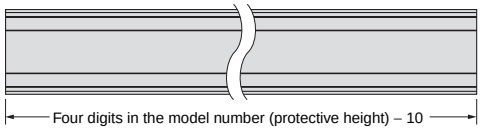

Material: Stainless steel

## Spatter Protection Cover

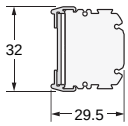
**F39-HJ□□□□**






Assembled dimensions

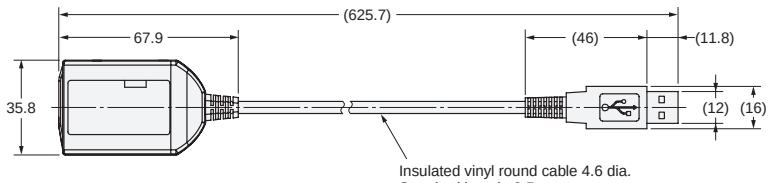


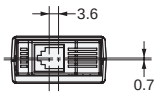

Material: polycarbonate (for the protective cover)

## Setting Support Software for the F3SJ

**F39-GWUM**

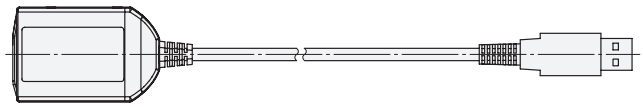






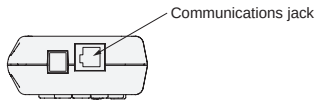


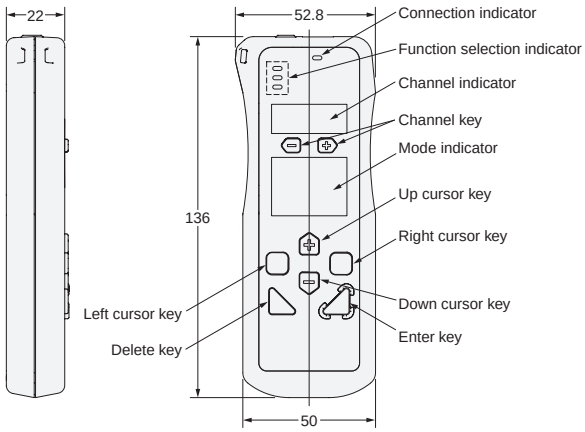


## Setting Console

**F39-MC21**





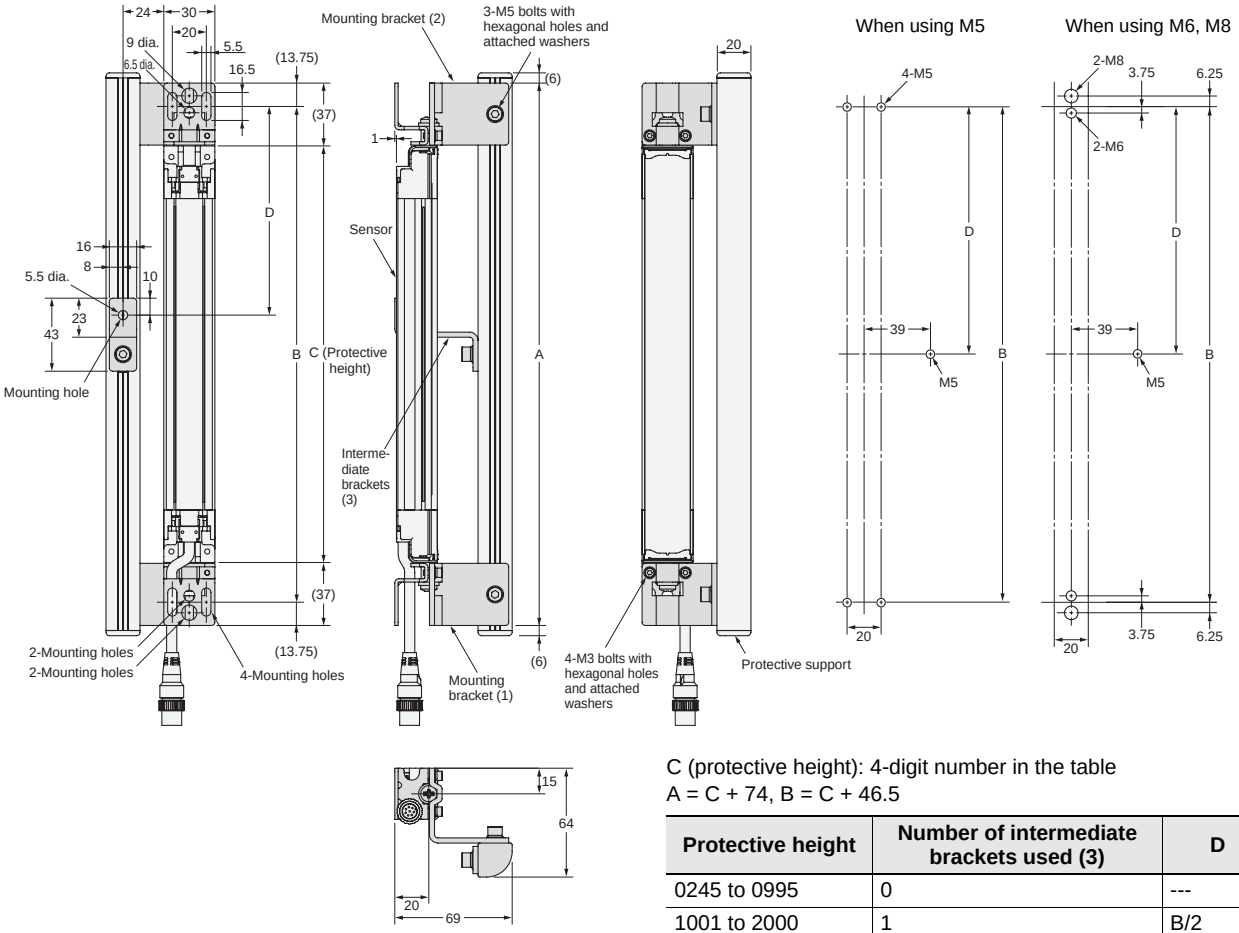



## Protective Bar

**F39-PJ□□□□-S**

**Backside mounting**









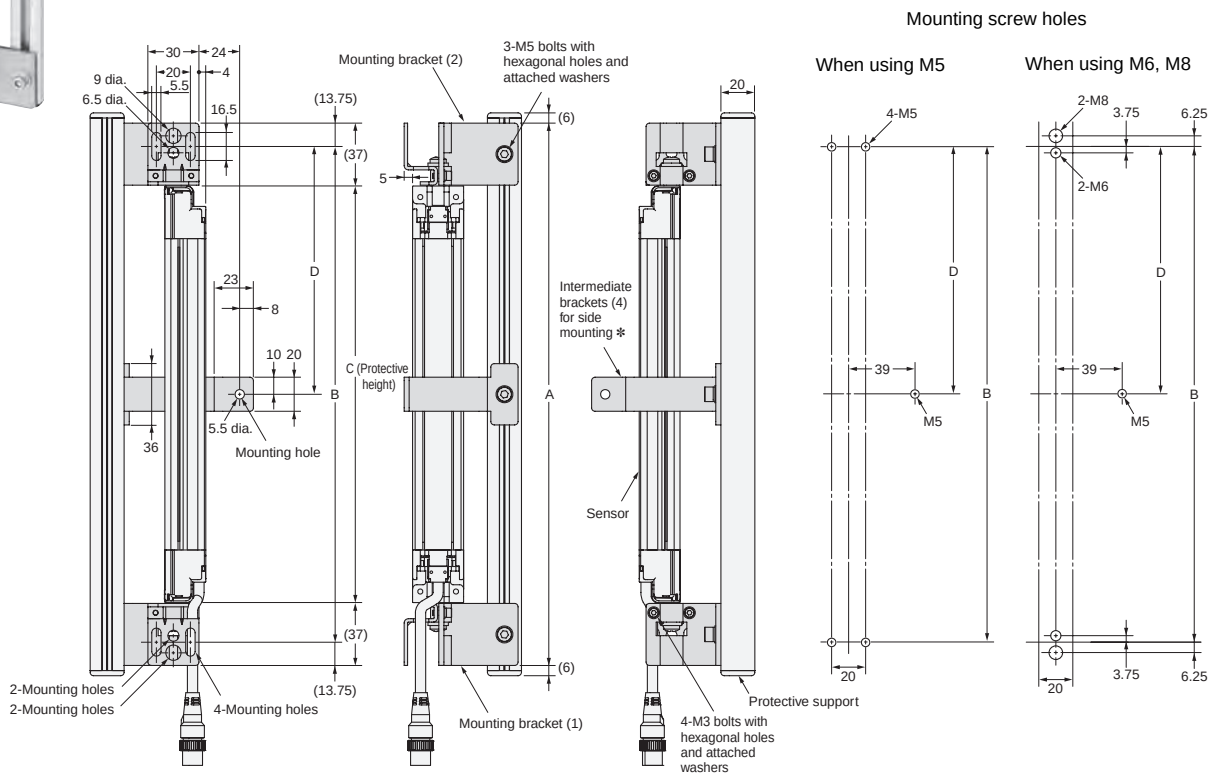
C (protective height): 4-digit number in the table
A = C + 74, B = C + 46.5

| Protective height | Number of intermediate brackets used (3) | D |
|---|---|---|
| 0245 to 0995 | 0 | --- |
| 1001 to 2000 | 1 | B/2 |
| 2009 to 2500 | 2 | B/3 |

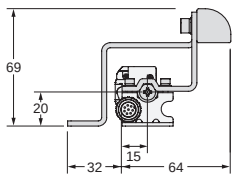
**Note:** For reference, D is the dimension that will not interfere with the intermediate bracket on the Safety Light Curtain body.

### Side mounting






✻ The four intermediate brackets (F39-PJ-MS) for side mounting are not provided.




C (protective height): 4-digit number in the table
A = C + 74, B = C + 46.5

| Protective height | Number of protective brackets used (4) | D |
|---|---|---|
| 0245 to 0995 | 0 | --- |
| 1001 to 2000 | 1 | B/2 |
| 2009 to 2500 | 2 | B/3 |

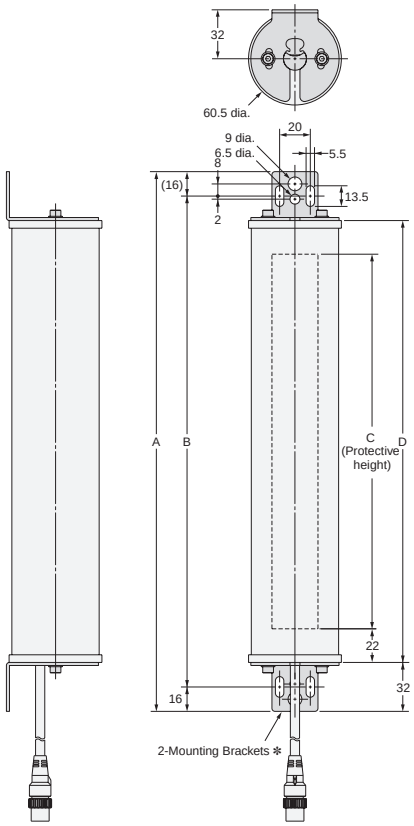
**Note:** For reference, D is the dimension that will not interfere with the intermediate bracket on the Safety Light Curtain body.

## Water-resistant Case

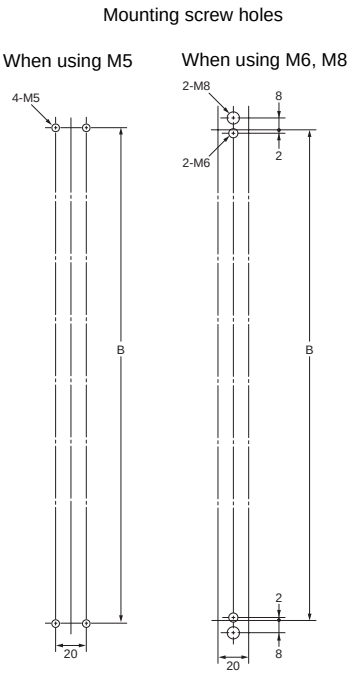
**F39-EJ□□□□-L(D)**

**Backside mounting**






Mounting screw holes



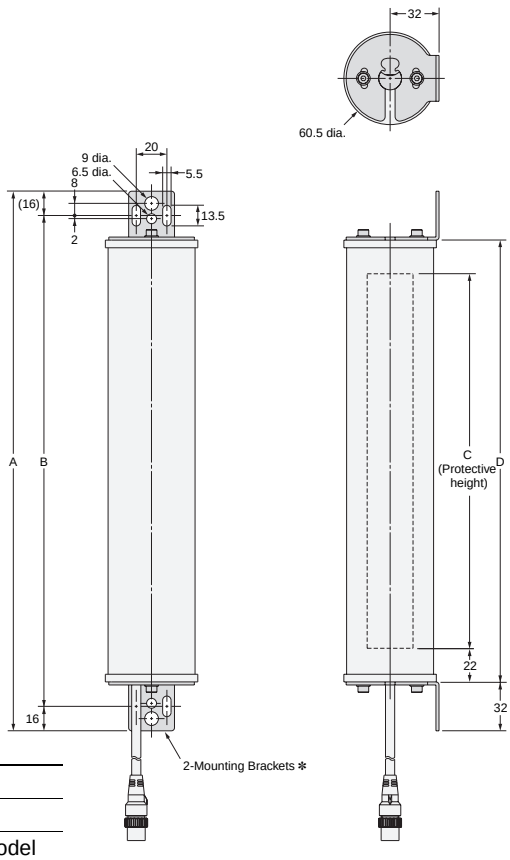

✻ The Mounting Brackets (F39-EJ-R) are sold separately.

Dimensions A to D

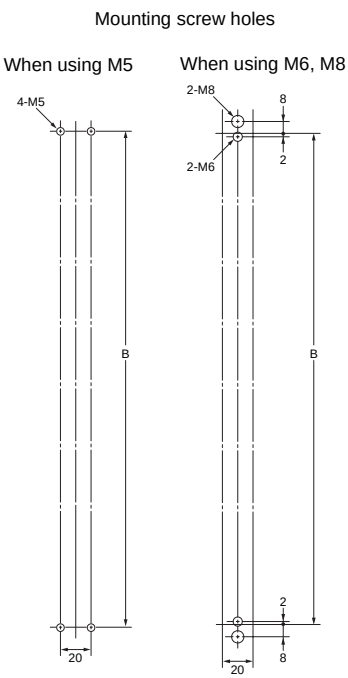
| | |
|---|---|
| A | C + 108 |
| B | C + 76 |
| C | 4-digit number of the model name (protective height) |
| D | C + 44 |

**Side mounting**






Mounting screw holes




✻ The Mounting Brackets (F39-EJ-S) are sold separately.

Dimensions A to D

| | |
|---|---|
| A | C + 108 |
| B | C + 76 |
| C | 4-digit number of the model name (protective height) |
| D | C + 44 |

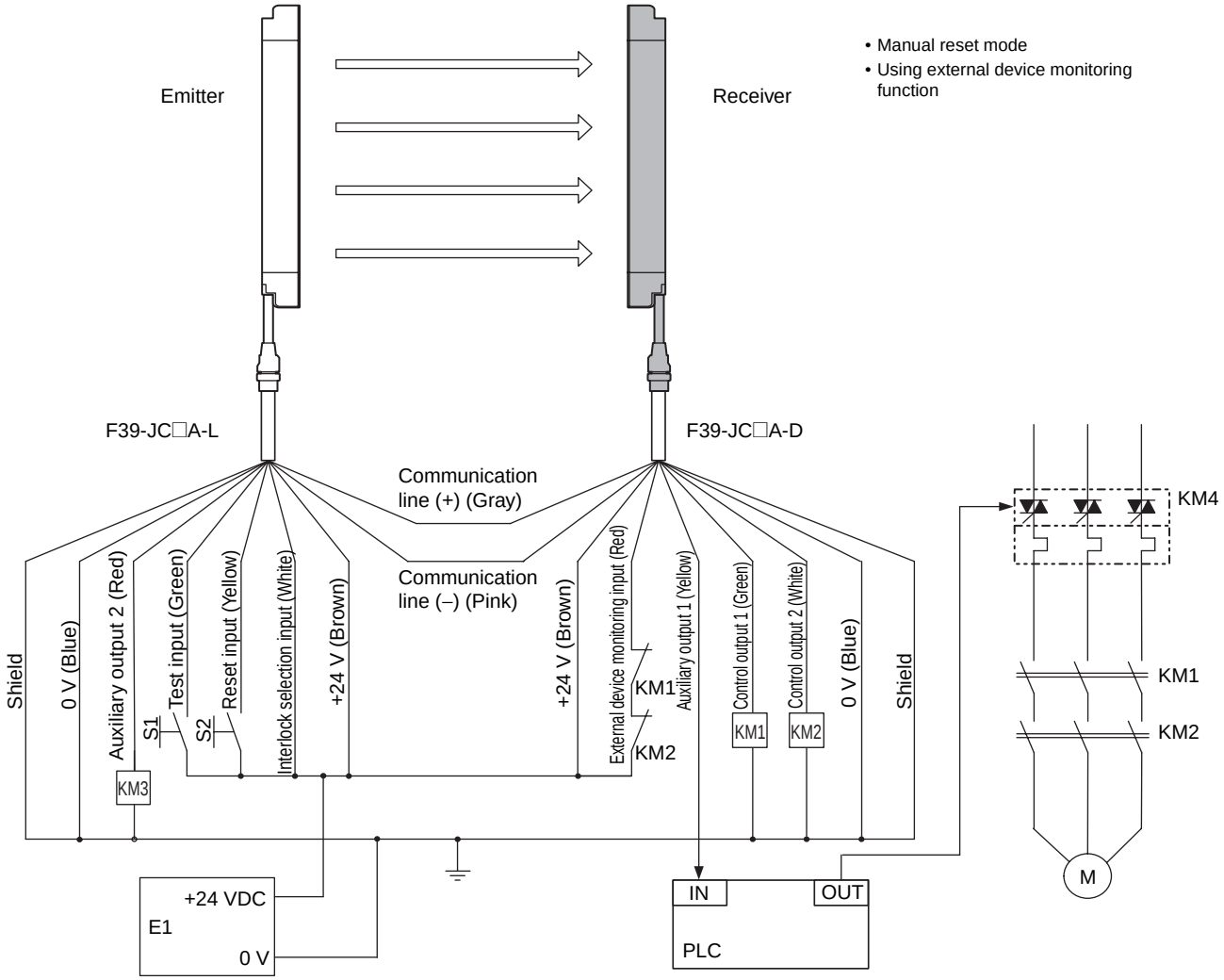
# Connection Circuit Examples

## Examples of Safety Circuits

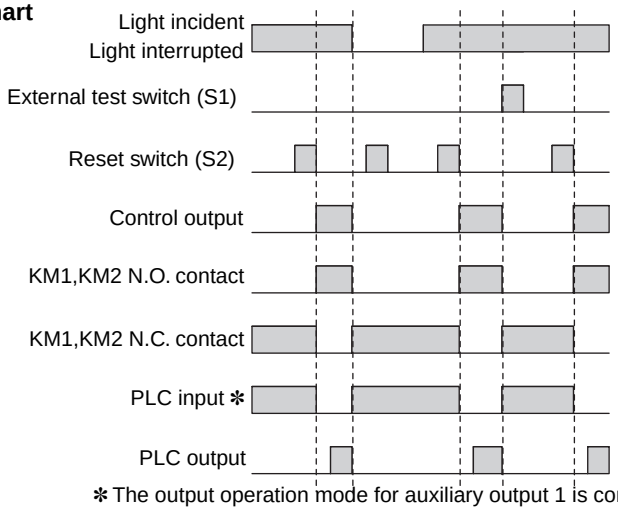
### For PNP output (See page 337 for NPN output wiring.)

#### Wiring for single F3SJ application (category 4)

- Use of welded relay contact detection and interlock is possible without a controller or relay unit.




**Timing Chart**

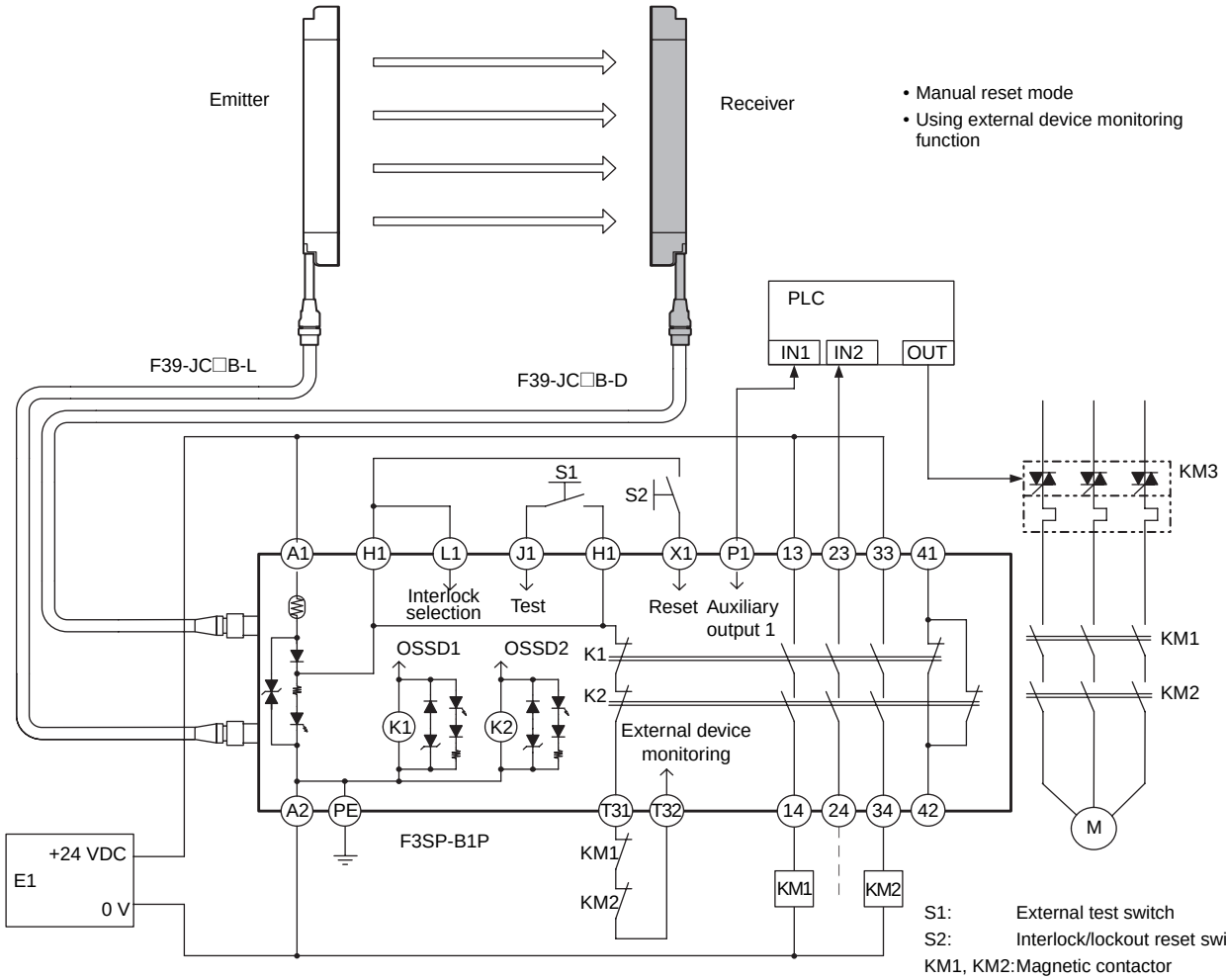



✻ The output operation mode for auxiliary output 1 is control output data/inverse of control output signals enabled (default setting).

S1: External test switch (connect to 0 V if the switch is not necessary.)
S2: Interlock/lockout reset switch
KM1, KM2: Safety relay with forcibly-guided contacts (G7SA) or magnetic contactor
KM3: Load, PLC (for monitor)
KM4: Solid state contactor (G3J)
M: 3-phase motor
E1: 24 VDC power supply (S82K)
PLC: Programmable controller (Used for monitoring -- not related to safety system)

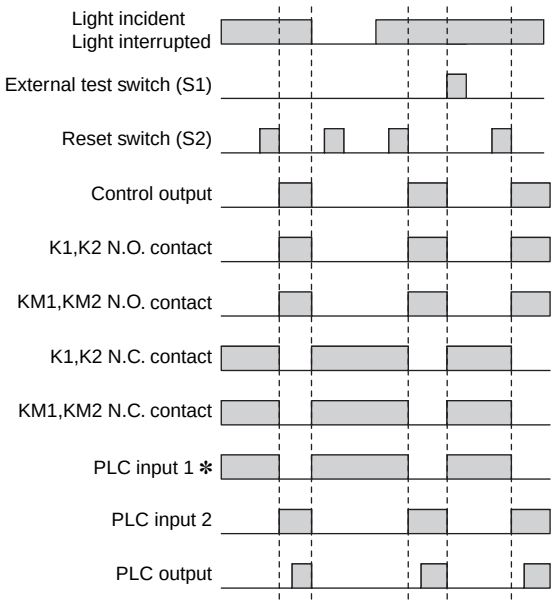
### Wiring for connection with a controller F3SP-B1P (category 4) (PNP models only)

- Reduced wiring due to connector connection
- Safety relay included




S1: External test switch
S2: Interlock/lockout reset switch
KM1, KM2: Magnetic contactor
KM3: Solid state contactor (G3J)
M: 3-phase motor
E1: 24 VDC power supply (S82K)
PLC: Programmable controller (Used for monitoring -- not related to safety system)

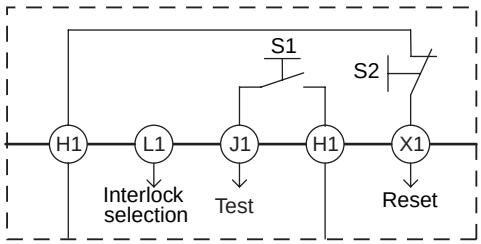
**Timing Chart**



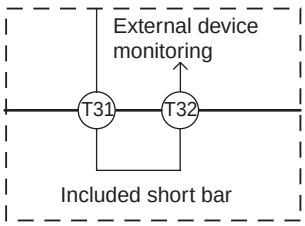

✻The output operation mode for auxiliary output 1 is control output data/inverse of control output signals enabled (default setting).

**Note:** When the F3SP-B1P is used, the system cannot be used as a muting system.

Wiring for auto reset mode

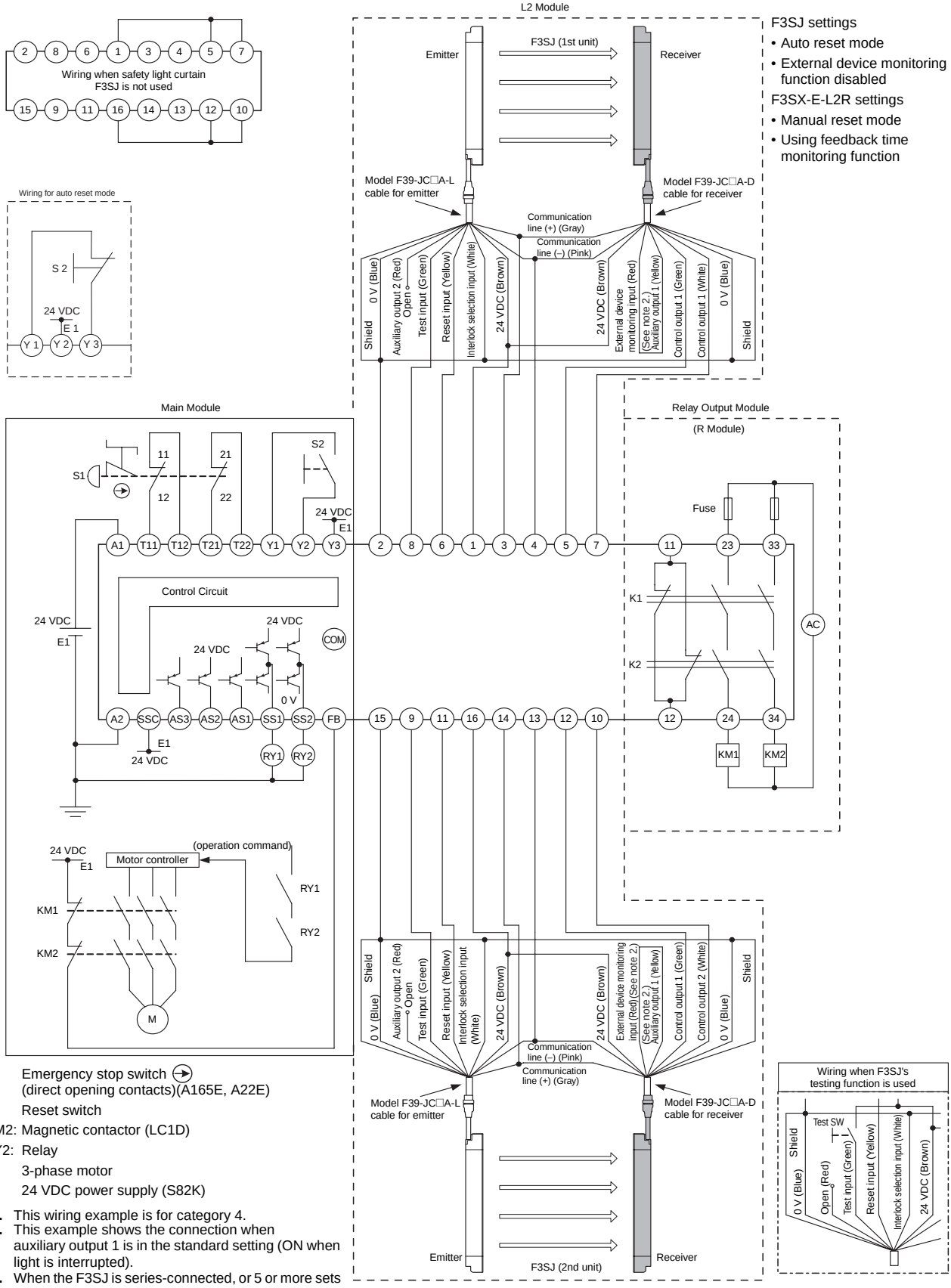



Wiring when the external device monitoring function will not be used



### Wiring for connection with a controller F3SX-E-L2R (category 4) (PNP models only)

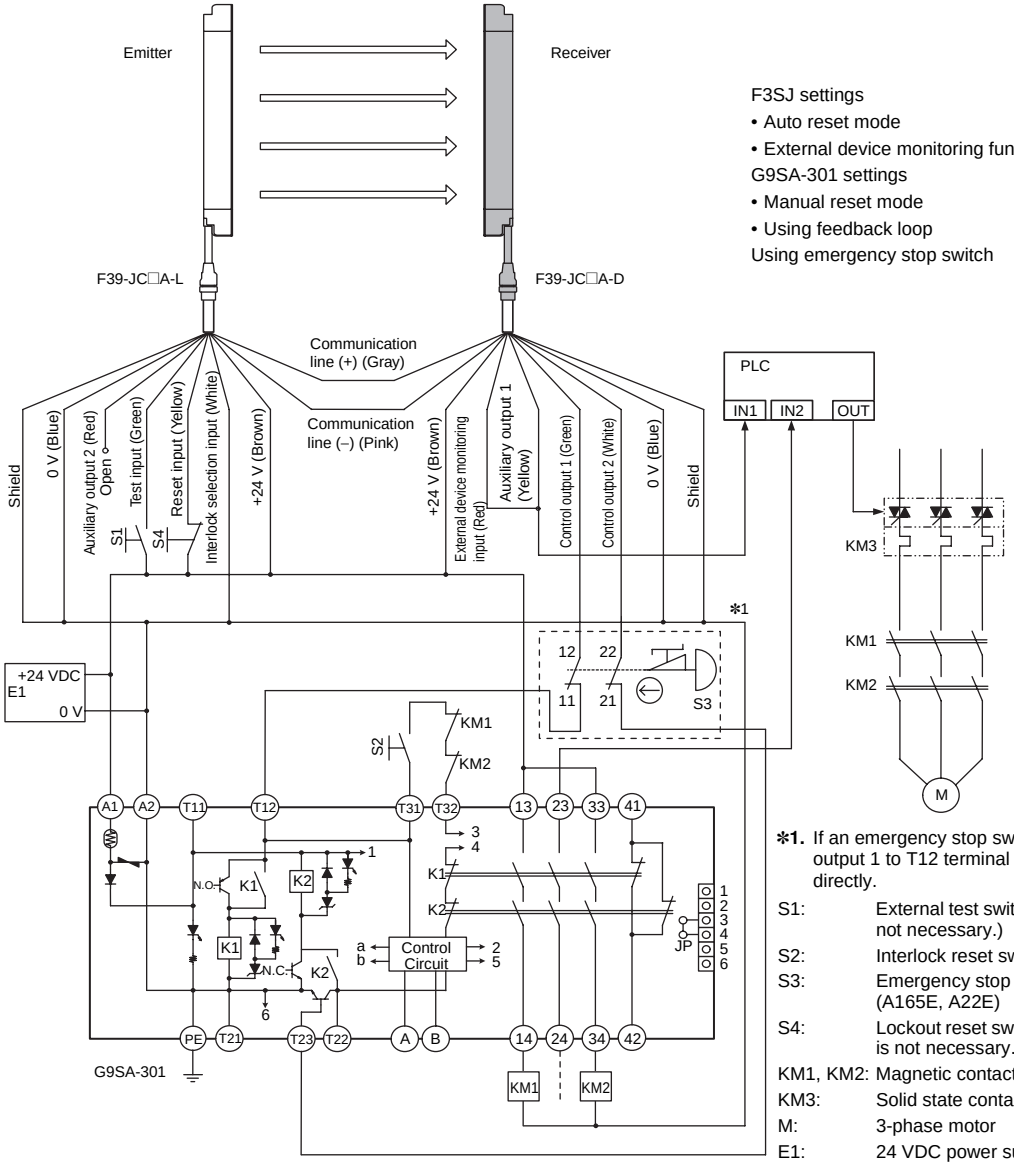
- Emergency stop switch can be connected.
- Door switch, two hand control, single beam, or relay unit can be used in combination with F3SX.
- Various settings can be changed and input/output terminals can be monitored using the setting support software for F3SX.




S1: Emergency stop switch (direct opening contacts)(A165E, A22E)
S2: Reset switch
KM1, KM2: Magnetic contactor (LC1D)
RY1, RY2: Relay
M: 3-phase motor
E1: 24 VDC power supply (S82K)

**Note:** **1.** This wiring example is for category 4.
**2.** This example shows the connection when auxiliary output 1 is in the standard setting (ON when light is interrupted).
**3.** When the F3SJ is series-connected, or 5 or more sets are connected to the total system of F3SX, power must be supplied to F3SJ from external source. For details, see instruction manual of F3SX.

## Wiring for connection with a controller G9SA-301 (category 4) (PNP models only)




F3SJ settings
- Auto reset mode
- External device monitoring function disabled

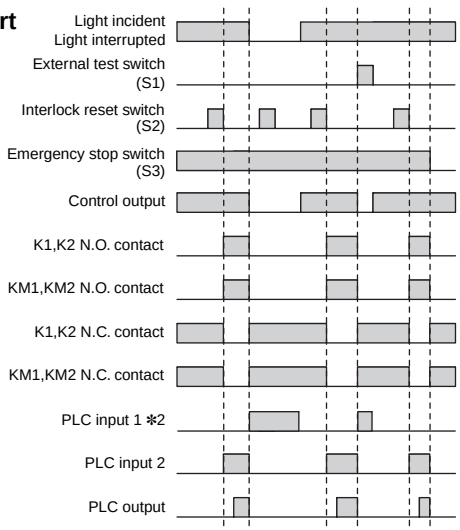
G9SA-301 settings
- Manual reset mode
- Using feedback loop

Using emergency stop switch

***1.** If an emergency stop switch is not used, connect control output 1 to T12 terminal and control output 2 to T23 directly.

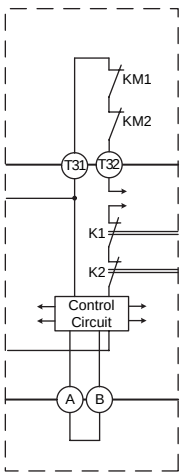
| | |
|---|---|
| S1: | External test switch (connect to 0 V if the switch is not necessary.) |
| S2: | Interlock reset switch |
| S3: | Emergency stop switch (direct opening contacts) (A165E, A22E) |
| S4: | Lockout reset switch (connect to 24 V if the switch is not necessary.) |
| KM1, KM2: | Magnetic contactor |
| KM3: | Solid state contactor (G3J) |
| M: | 3-phase motor |
| E1: | 24 VDC power supply (S82K) |
| PLC: | Programmable controller (Used for monitoring -- not related to safety system) |

### Timing Chart



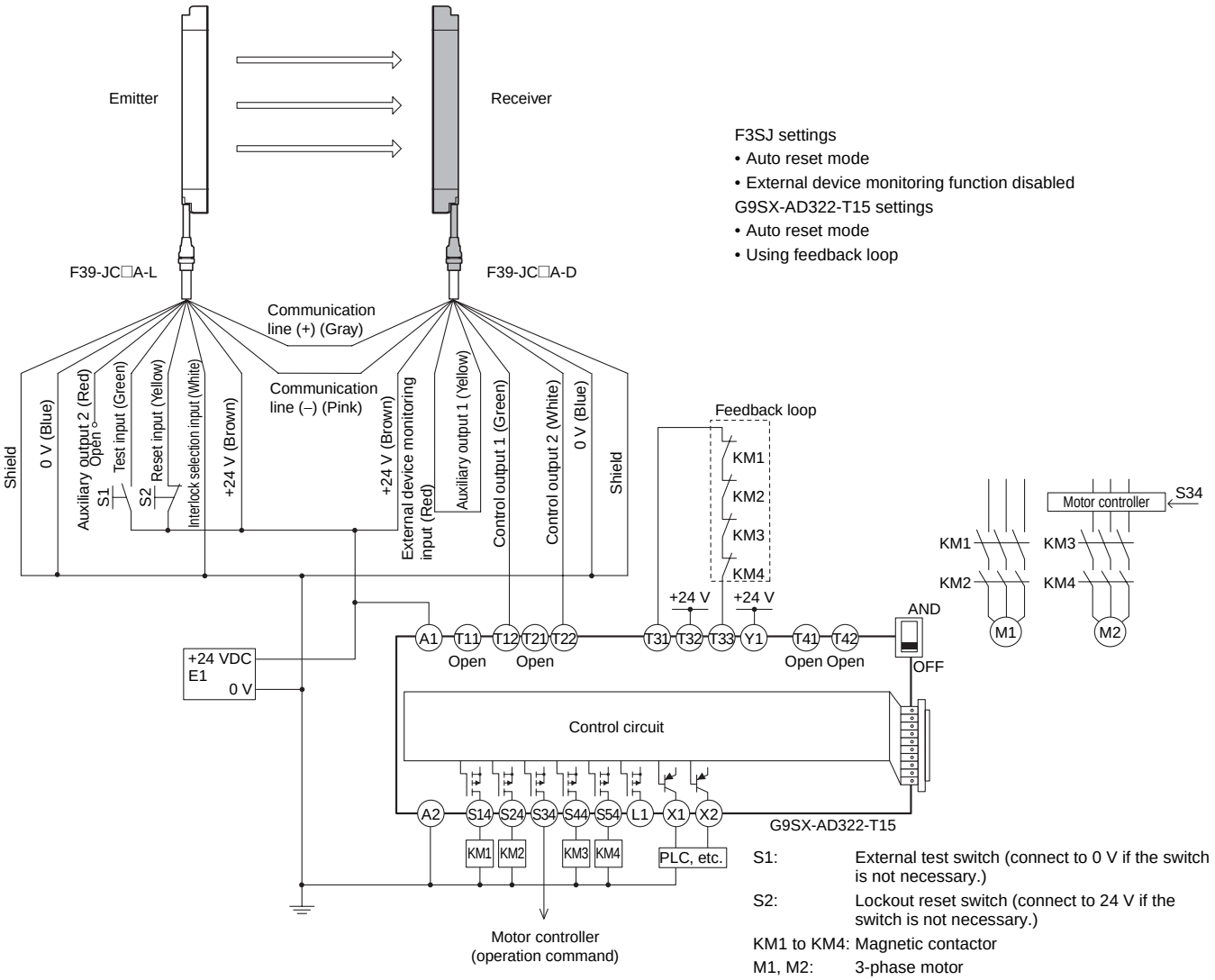

***2.** The output operation mode for auxiliary output 1 is control output data/inverse of control output signals enabled (default setting).

Wiring for auto reset mode



### Wiring for connection with a controller G9SX-AD322-T15 (category 4) (PNP models only)

- Can be configured for partial control and total control.
- Can be extended to connect a door switch or a relay unit.

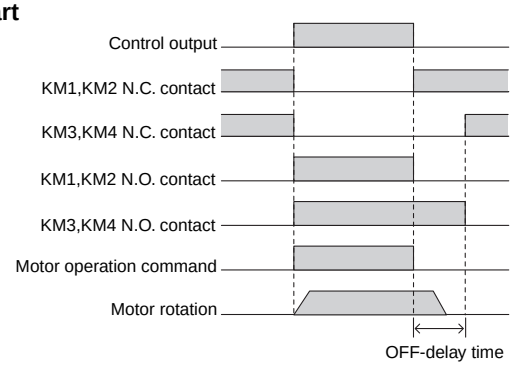



F3SJ settings
- Auto reset mode
- External device monitoring function disabled

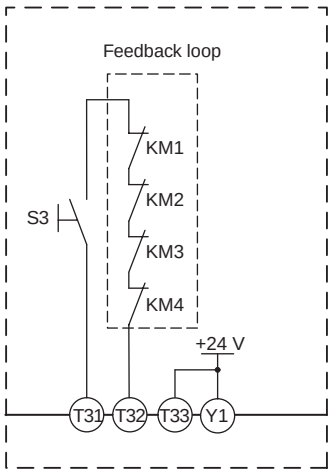
G9SX-AD322-T15 settings
- Auto reset mode
- Using feedback loop

S1: External test switch (connect to 0 V if the switch is not necessary.)
S2: Lockout reset switch (connect to 24 V if the switch is not necessary.)
KM1 to KM4: Magnetic contactor
M1, M2: 3-phase motor
E1: 24 VDC power supply (S82K)
PLC: Programmable controller (Used for monitoring -- not related to safety system)

### Timing Chart




Wiring for manual reset mode

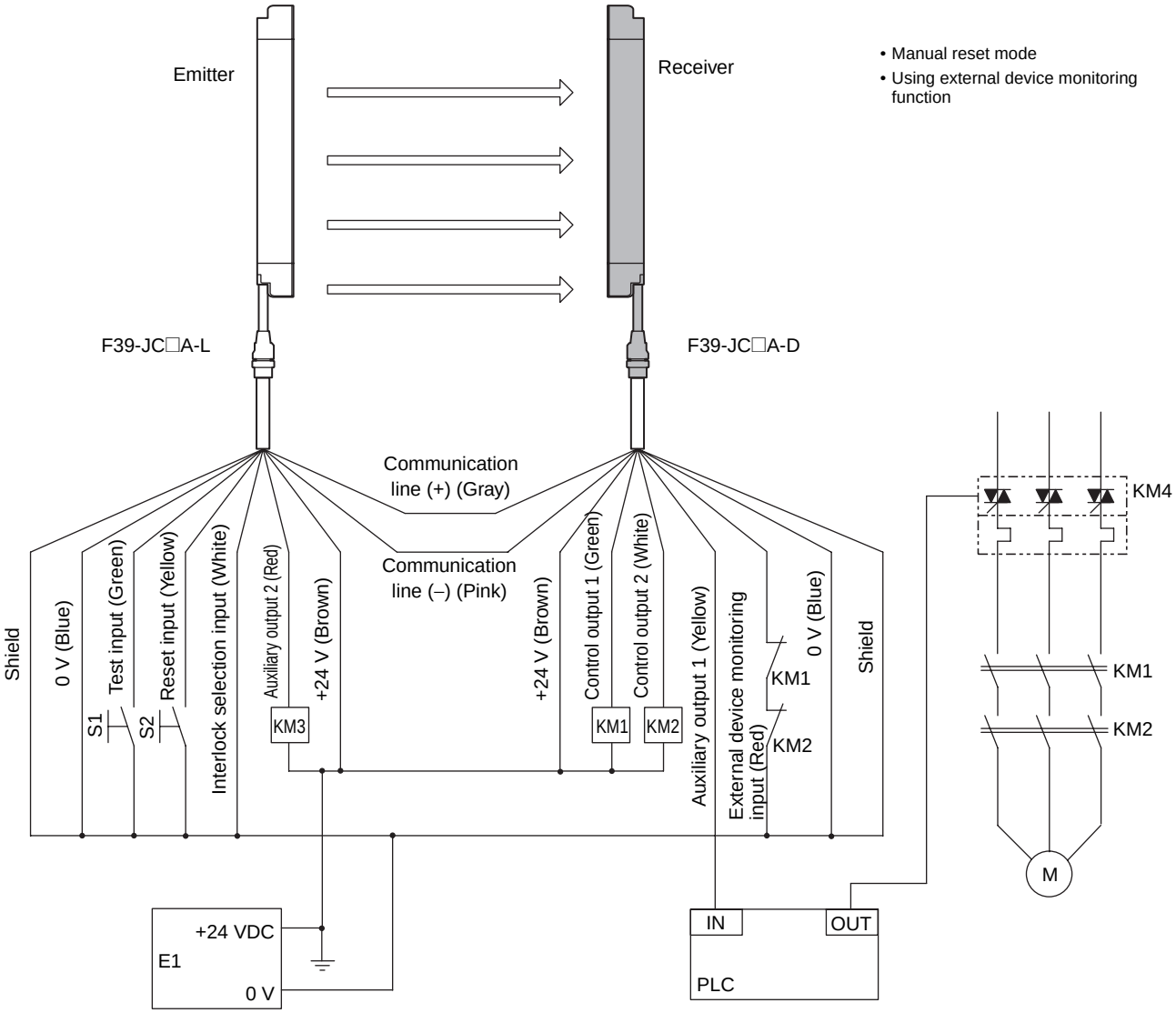



S3: Reset switch

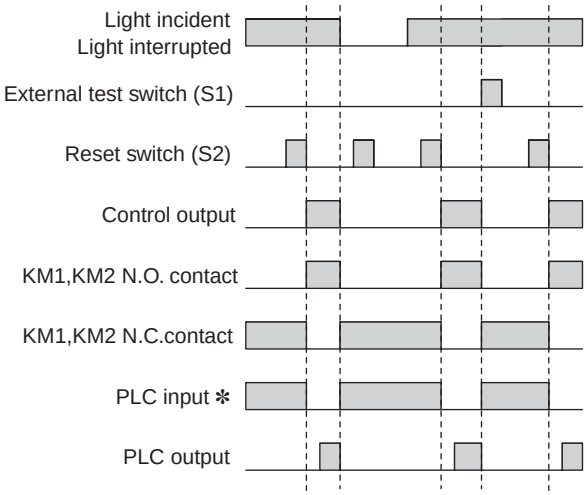
## For NPN output (See page 332 for PNP output wiring.)

### Wiring for single F3SJ application (category 4)

- Use of relay welded relay contact detection and interlock is possible without a controller or relay unit.



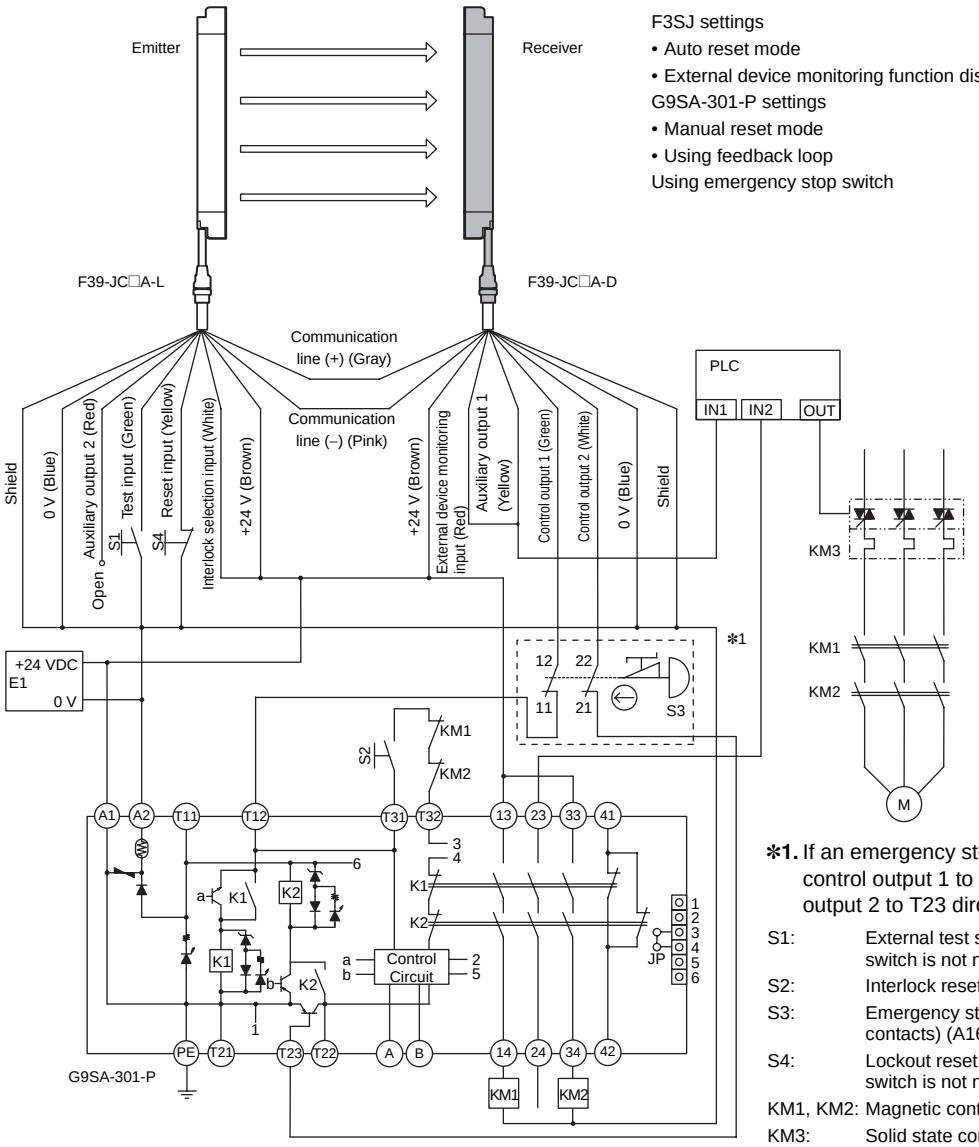

### Timing Chart




✻ The output operation mode for auxiliary output 1 is control output data/inverse of control output signals enabled (default setting).

| | |
|---|---|
| S1: | External test switch (connect to 24 V if the switch is not necessary.) |
| S2: | Interlock/lockout reset switch |
| KM1, KM2: | Safety relay with forcibly-guided contacts (G7SA) or magnetic contactor |
| KM3: | Load, PLC (for monitor) |
| KM4: | Solid state contactor (G3J) |
| M: | 3-phase motor |
| E1: | 24 VDC power supply (S82K) |
| PLC: | Programmable controller (Used for monitoring -- not related to safety system) |

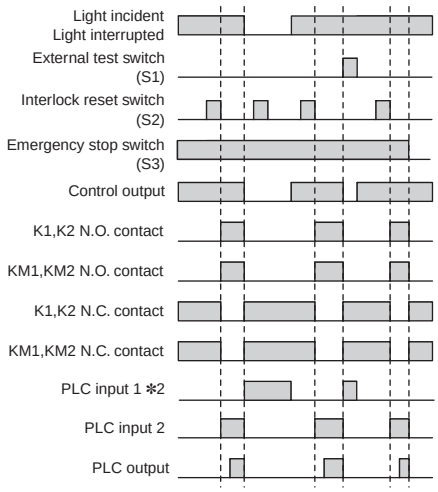
## Wiring for connection with a controller G9SA-301-P (category 4) (NPN models only)




*1. If an emergency stop switch is not used, connect control output 1 to T12 terminal and control output 2 to T23 directly.

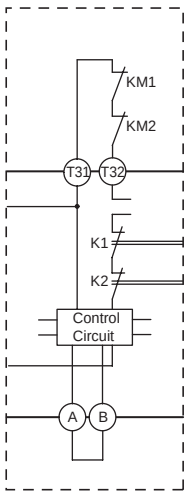
S1: External test switch (connect to 24 V if the switch is not necessary.)
S2: Interlock reset switch
S3: Emergency stop switch (direct opening contacts) (A165E, A22E)
S4: Lockout reset switch (connect to 0 V if the switch is not necessary.)
KM1, KM2: Magnetic contactor
KM3: Solid state contactor (G3J)
M: 3-phase motor
E1: 24 VDC power supply (S82K)
PLC: Programmable controller (Used for monitoring -- not related to safety system)

### Timing Chart




*2. The output operation mode for auxiliary output 1 is control output data/inverse of control output signals enabled (default setting).

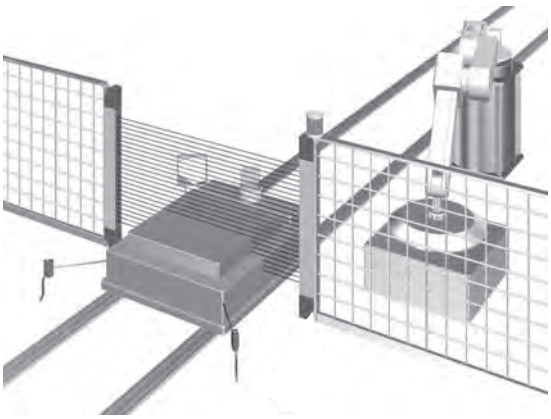
Wiring for auto reset mode



# System Configuration and Connection (Muting system)

## Muting System

The muting function temporarily disables the safety function of the F3SJ, keeping the control outputs ON even if beams are interrupted. This makes it possible to install safety light curtains for AGV passage, enabling both safety and productivity.
When muting, the muting lamp (external indicator) blinks to notify people in the surrounding area that the safety functions are disabled.
For each operation modes, refer to page 354.



**⚠ WARNING**

The muting and override functions disable the safety functions of the device. Additional safety measures must be taken to ensure safety while these functions are working.

---

Install muting sensors so that they can distinguish between the object that is being allowed to be pass through the detection zone and a person.
If the muting function is activated by the detection of a person, it may result in serious injury.

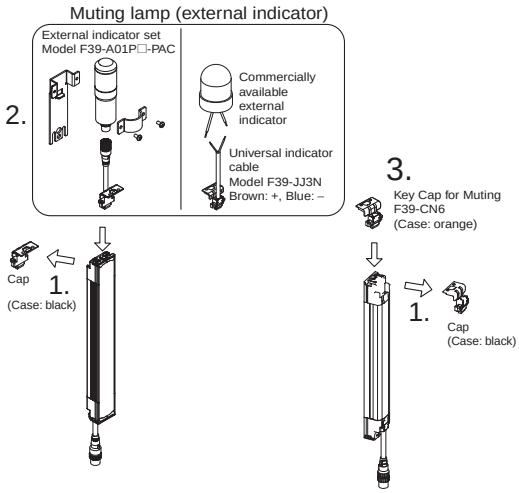
---

Muting lamps (external indicators) that indicate the state of the muting and override functions must be installed where they are clearly visible to workers from all the operating positions.

---

## Upgrading F3SJ for Muting System

1. Remove the caps of the emitter and receiver.
   (A screwdriver is included with the key cap for muting.)
2. Install a muting lamp (external indicator) on either the emitter or receiver.
3. Attach the key cap for muting to the emitter/receiver on which the muting lamp (external indicator) was not installed.




## Muting Sensor

A muting sensor is the sensor that is the trigger for temporarily disabling the safety functions of F3SJ. You can use a through-beam or retro-reflective photoelectric switch, a proximity sensor, or a limit switch as the muting sensor. (OMRON's E3Z-series, E2E-series (3-wire), E2VX-series, and D4N-series Sensors are recommended.)
For an F3SJ model with PNP output, use a sensor with a 3-wire PNP transistor output or a NO contact output. For an F3SJ model with NPN output, use a sensor with a 3-wire NPN transistor output or a NO contact output.
Two-wire sensors cannot be used.

## Muting Lamp (External indicator)

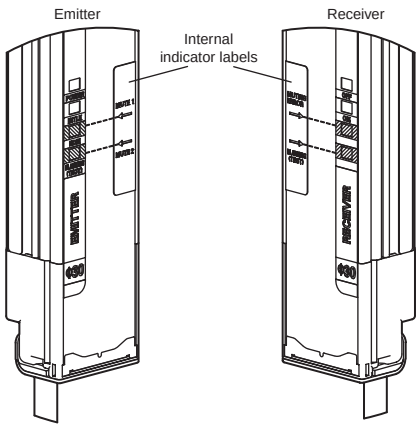
To notify workers that the muting function is working, external lamp(s) must be installed. Use the F39-A01P□-PAC external indicator set or an F39-JJ3N universal indicator cable with a commercially available external indicator.

## F3SJ Internal Indicators

- The muting input 1 indicator turns ON when input is applied to muting input 1.
- The muting input 2 indicator turns ON when input is applied to muting input 2.
- The muting input 1 indicator and muting input 2 indicator blink under muting override.
- The muting error indicator on the receiver side turns ON when there is a muting error.

### Attachment Positions for Included Labels

Internal indicator labels are included with the F39-CN6 Key Cap for Muting. When using a muting system, attach the internal indicator labels so the arrows will be in line with the positions of the indicators, as shown by the shading below.



## Standard Muting Mode

The F3SJ is set to this operation mode when it is shipped from the factory. The muting function is enabled by providing a time lag between muting inputs 1 and 2. Use a separately purchased setting tool to change parameters related to muting time, or to select other muting operation modes.

### Start Conditions

If both of the following 2 conditions are present, muting is activated.

1. No interrupting object is found in the F3SJ's detection zone, and control output is ON.
2. After muting input 1 is turned ON (connected to 9 to 24 V for PNP types, or to 0 to 1.5 V for NPN types), muting input 2 is turned ON (connected to 9 to 24 V for PNP types, or to 0 to 1.5 V for NPN types) within the muting input time limit T1 min. to T1 max. (0.03 to 3 s).

Once the conditions in item 2 above are met, the muting function will be enabled in 0.15 s max.

When condition 1 is satisfied but time condition of 2 is not, a muting sequence error occurs and receiver's muting error indicator turns ON. However, the F3SJ safety functions will continue operating and the F3SJ will operate normally even during a muting error.

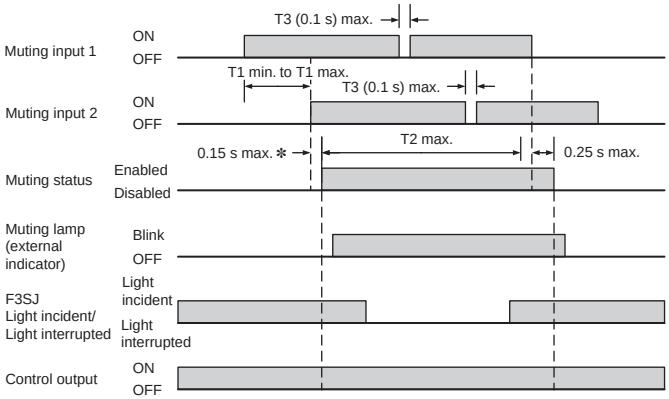
A muting error is released when either of the following occurs:

- When muting is started using a proper procedure
- When power is turned on while muting inputs 1 and 2 are OFF

### End Conditions

If either of the following conditions are satisfied, the muting state is released.

1. Muting input 1 or 2 turns OFF for T3 (0.1 s) or longer.
2. When the muting continuation time exceeds the muting time limit of T2 (60 s) (a setting tool can be used to change the limit in the range of 1 to 600 s, or to eliminate the time limit)




✻ This value is the time when the F3SJ is used singly. When used in a series, this time is as shown in the table below.

| Number of Connected Units | ✻ Time (s) |
|---|---|
| 1 | 0.15 |
| Series of 2 | 0.26 |
| Series of 3 | 0.29 |
| Series of 4 | 0.32 |

- T1 min: Muting input time limit (min.)
  This is the minimum input time lag between muting inputs 1 and 2, and is set to 0.03 s. If the time lag between muting inputs 1 and 2 are shorter than this value, a muting error is generated.
- T1 max: Muting input time limit (max.)
  This is the maximum input time lag between muting inputs 1 and 2, and is set to 3 s. The minimum value must be less than the maximum value (min. < max.).
- T2: Muting time limit
  This is the continuous time of the muting function, and is set to 60 s. If the muting status exceeds this time, muting is cancelled.
- T3: Allowable pulse-change time for muting input signals
  This is the maximum time allowed for a change in the waveform pulse of muting inputs 1 and 2 while in the muting status.

**Note:** The muting status can be released even when the system enters lockout.

The following values can be changed using the Setting Support Software for the F3SJ:

- T1 min: Muting input time limit (min.)
- T1 max: Muting input time limit (max.)
- T2: Muting time limit

The following values can be changed using the Setting Console:

- T2: Muting time limit

### Installation Standard for Muting Sensors

- Set the muting sensors so that they can detect all of the passing detection objects (palettes, automobiles, etc.). Do not install in a position so that only the front or rear end of the detection object is detected.
- Set the muting sensors so that they detect the objects even when they are loaded on palettes or other transport devices.
- Install the F3SJ and muting sensors so that each object passes through all muting sensors before the next object arrives at the first muting sensor. Also, install all F3SJ and muting sensors so that no person is able to accidentally enter the hazardous area while the muting function is enabled.
- When objects pass through the muting area at different speeds, consider limiting the muting time.
- For a muting sensor installation example, see the instruction manual.
- For details about the override function, see the instruction manual.

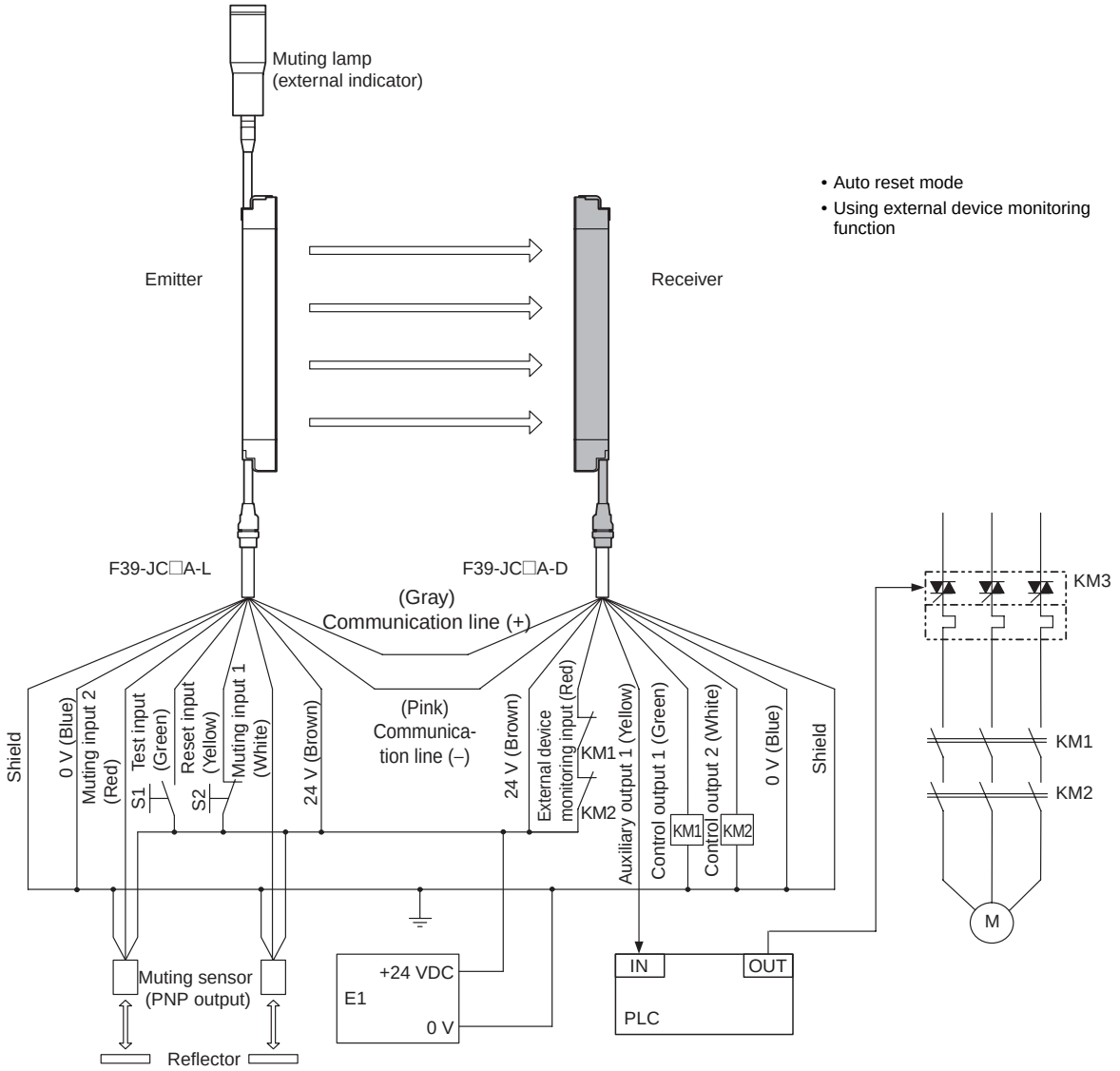
# Example of a Safety Circuit with the Muting System

## For PNP output

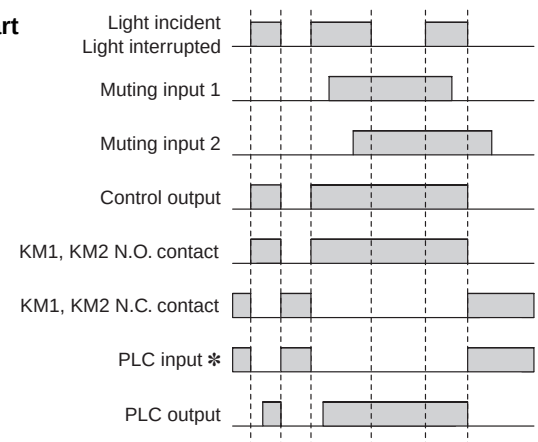
### Wiring for muting function with single F3SJ application (category 4)

### When two muting sensors are connected

- Attaching a keycap for muting (F39-CN6) enables the muting function to be used.




**Timing Chart**



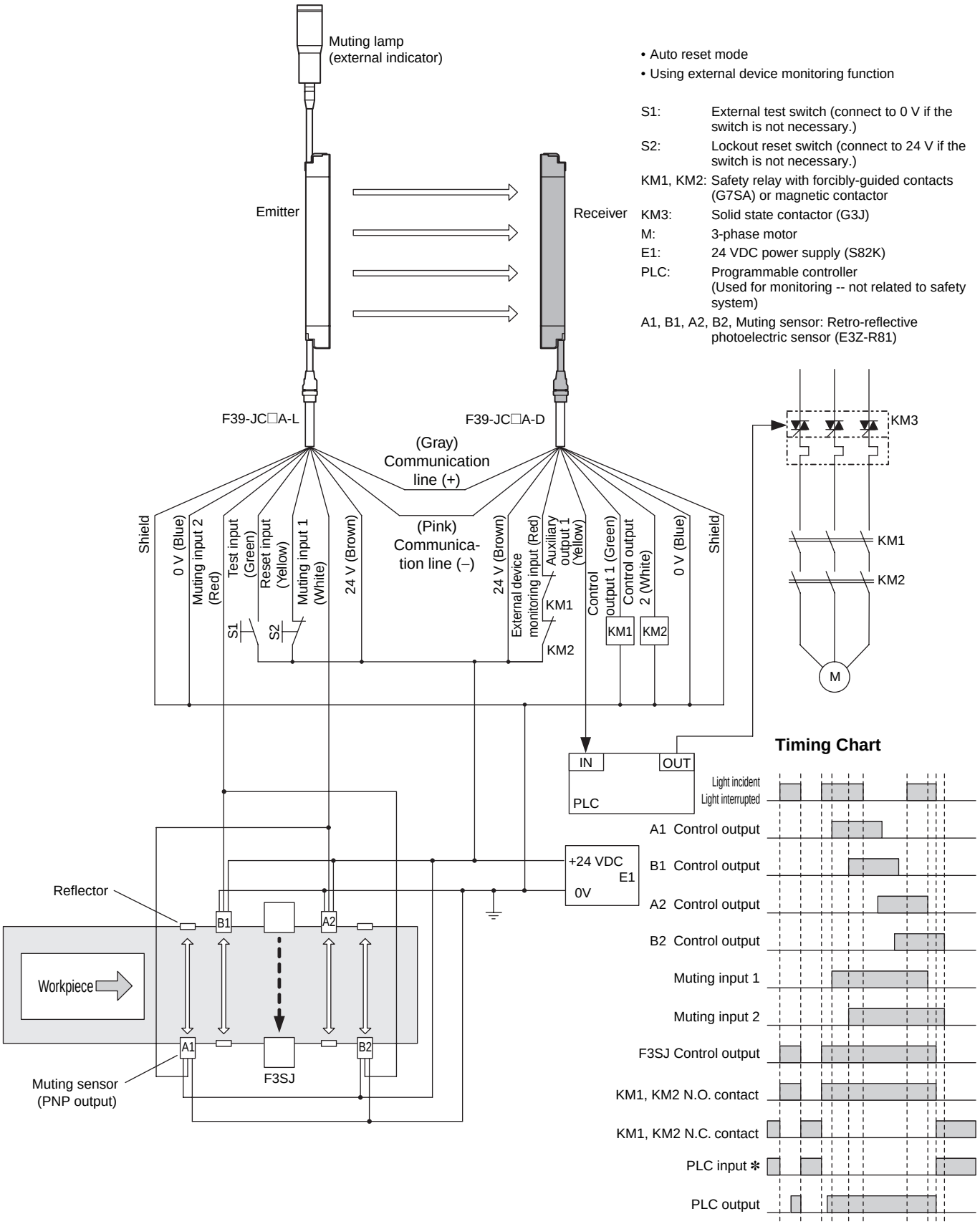

S1: External test switch (connect to 0 V if the switch is not necessary.)
S2: Lockout reset switch (connect to 24 V if the switch is not necessary.)
KM1, KM2: Safety relay with forcibly-guided contacts (G7SA) or magnetic contactor
KM3: Solid state contactor (G3J)
M: 3-phase motor
E1: 24 VDC power supply (S82K)
PLC: Programmable controller (Used for monitoring -- not related to safety system)
Muting sensor: Retro-reflective photoelectric sensor (E3Z-R81)

✻ The output operation mode for auxiliary output 1 is control output data/inverse of control output signals enabled (default setting).

**Note:** Start interlock and restart interlock can be used with a setting tool.

### When four muting sensors are connected

- The muting function can be used by attaching the F39-CN6 Key Cap.




- Auto reset mode
- Using external device monitoring function

| | |
|---|---|
| S1: | External test switch (connect to 0 V if the switch is not necessary.) |
| S2: | Lockout reset switch (connect to 24 V if the switch is not necessary.) |
| KM1, KM2: | Safety relay with forcibly-guided contacts (G7SA) or magnetic contactor |
| KM3: | Solid state contactor (G3J) |
| M: | 3-phase motor |
| E1: | 24 VDC power supply (S82K) |
| PLC: | Programmable controller (Used for monitoring -- not related to safety system) |
| A1, B1, A2, B2, Muting sensor: | Retro-reflective photoelectric sensor (E3Z-R81) |

**Timing Chart**




✻ The output operation mode for auxiliary output 1 is control output data/inverse of control output signals enabled (default setting).

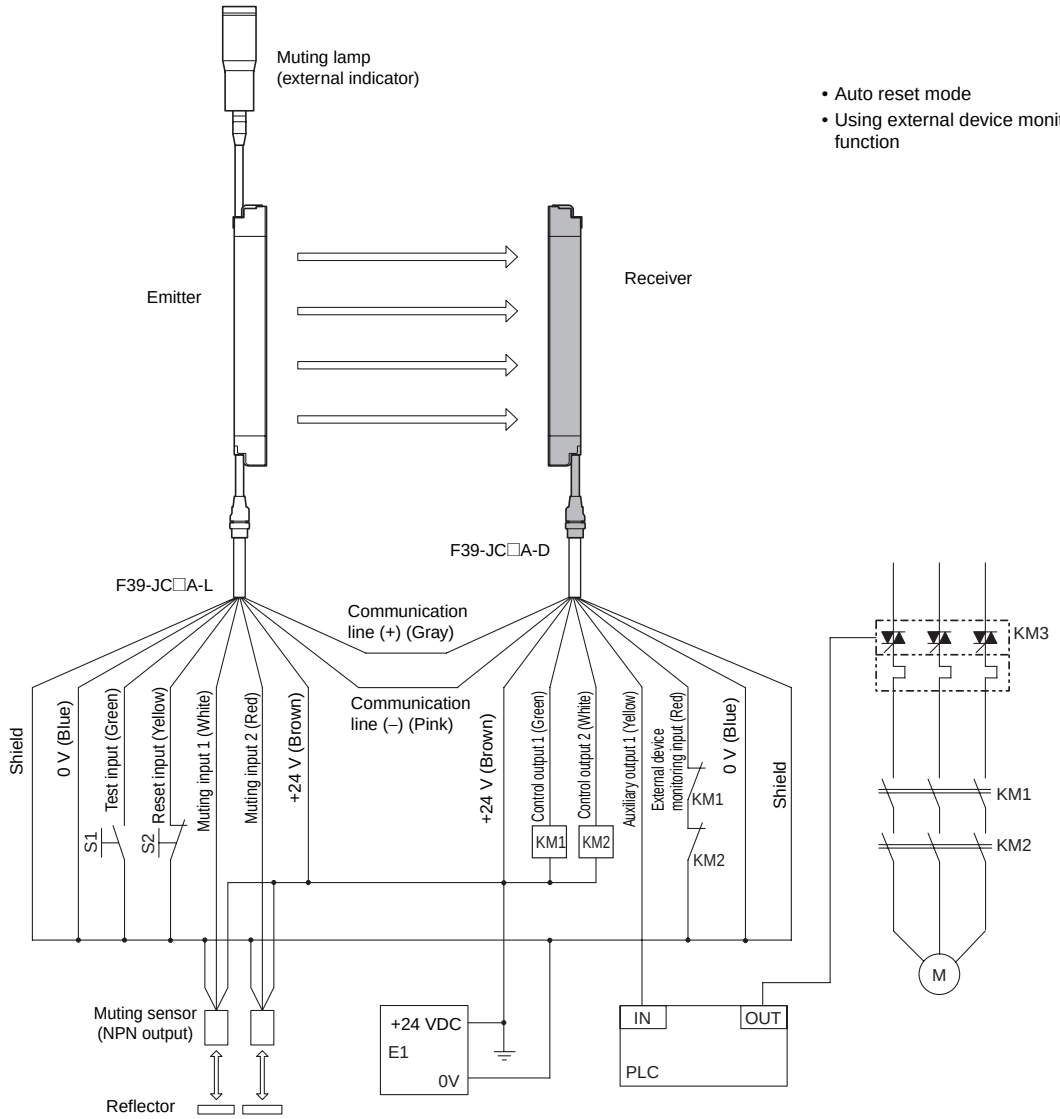
**Note:** Start interlock and restart interlock can be used with a setting tool.

## For NPN output

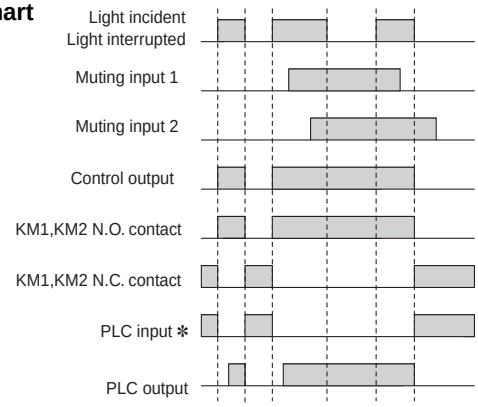
### Wiring for muting function with single F3SJ application (category 4)

### When two muting sensors are connected

- Attaching a keycap for muting (F39-CN6) enables the muting function to be used.




### Timing Chart




S1: External test switch (connect to 24 V if the switch is not necessary.)

S2: Lockout reset switch (connect to 0 V if the switch is not necessary.)

KM1, KM2: Safety relay with forcibly-guided contacts (G7SA) or magnetic contactor

KM3: Solid state contactor (G3J)

M: 3-phase motor

E1: 24 VDC power supply (S82K)

PLC: Programmable controller
(Used for monitoring -- not related to safety system)

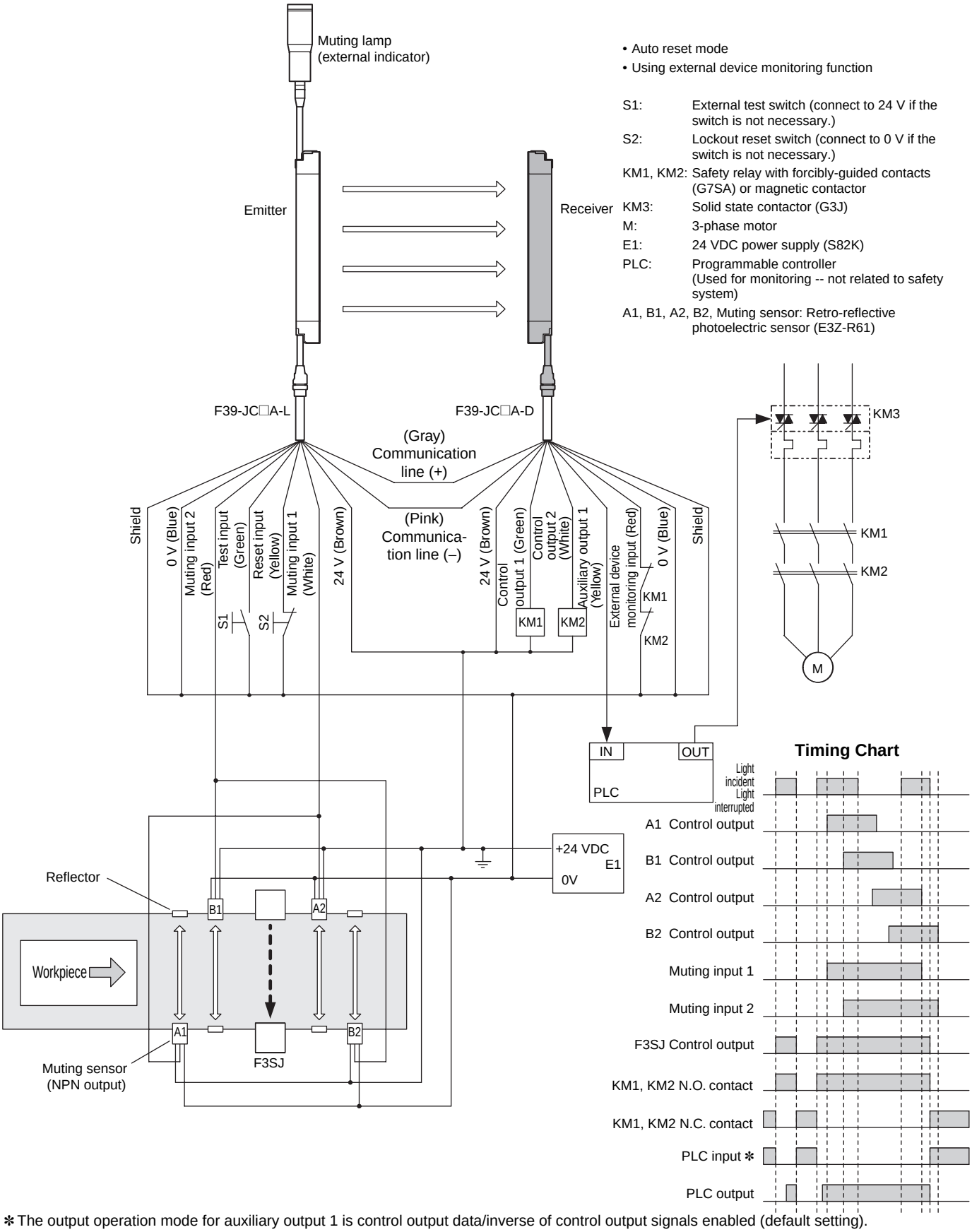
Muting sensor: Retro-reflective photoelectric sensor (E3Z-R61)

✻ The output operation mode for auxiliary output 1 is control output data/ inverse of control output signals enabled (default setting).

**Note:** Start interlock and restart interlock can be used with a setting tool.

### When four muting sensors are connected

- The muting function can be used by attaching the F39-CN6 Key Cap.




**Timing Chart**



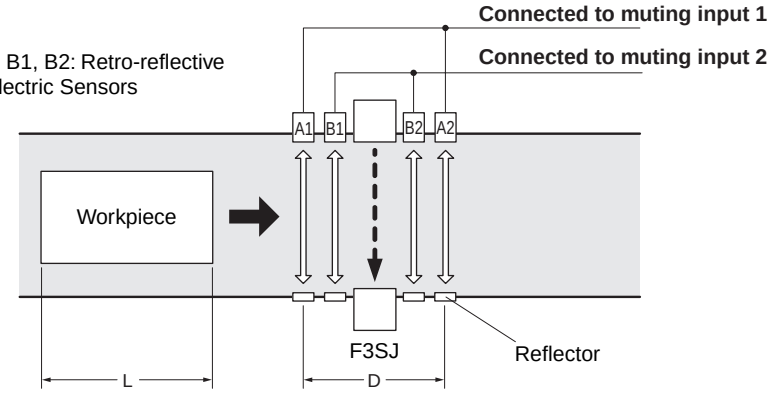

✻ The output operation mode for auxiliary output 1 is control output data/inverse of control output signals enabled (default setting).

**Note:** Start interlock and restart interlock can be used with a setting tool.

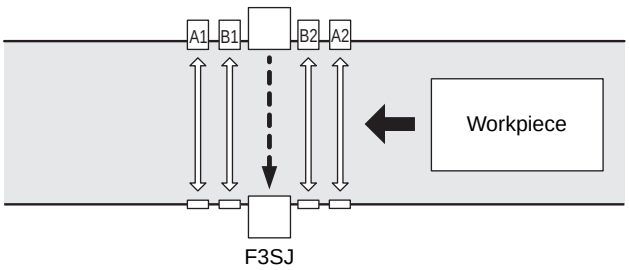
## Setting Bi-directional Muting

- Connect the outer muting sensors A1 and A2 to muting input 1 and the inner muting sensors B1 and B2 to muting input 2.
- When muting sensors A1 and then B1 (or A2 and then B2) turn ON in that order, the F3SJ will enter the muting state.

A1, A2, B1, B2: Retro-reflective Photoelectric Sensors




- Muting from the opposite direction is also possible.




**Note: 1.** This example arrangement uses E3Z-R□□ Retro-reflective Photoelectric Sensors as the muting sensors. Mutual interference must be taken into account when installing these Sensors.

**2.** The muting sensors must be installed so that distance D between muting sensors A1 and A2 is smaller than workpiece length L.

**3.** Through-beam or Retro-reflective Photoelectric Sensors, Proximity Sensors, or Limit Switches can be used as the muting sensors. Two-wire sensors cannot be used.

# Safety Precautions

This catalog is intended as a guide for product selection. Be sure to use the instruction manual provided with the product for actual operation.

## Regulations and Standards

**1.** Application of an F3SJ-A sensor alone cannot receive type certification provided by Article 44-2 of the Labour Safety and Health Law of Japan. It is necessary to apply it in a system. Therefore, when using the F3SJ-A in Japan as a "safety system for pressing or shearing machines" prescribed in Article 42 of that law, the system must receive type certification.

**2.** The F3SJ-A is electro-sensitive protective equipment (ESPE) in accordance with European Union (EU) Machinery Directive Index Annex IV, B, Safety Components, Item 1.

**3.** The F3SJ-A complies with the following legislation and standards:

1. EU Regulations
   Machinery Directive: Directive 98/37/EC
   EMC Directive: Directive 2004/108/EC
2. European standards:
   EN61496-1 (TYPE 4 ESPE),
   prEN61496-2 (TYPE 4 AOPD),
   EN61508-1 to -7 (SIL3)
3. International standards:
   IEC61496-1 (TYPE 4 ESPE),
   IEC61496-2 (TYPE 4 AOPD),
   EN61508-1 to -7 (SIL3)
4. JIS standards:
   JIS B9704-1 (TYPE 4 ESPE),
   JIS B9704-2 (TYPE 4 AOPD)

**4.** The F3SJ-A received the following certification from the EU-accredited body, TÜV SÜD:

- EC type test based on machinery directive
  Type 4 ESPE (EN61496-1),
  Type 4 AOPD(prEN61496-2)
- TÜV SÜD Type Certification
  Type 4 ESPE (EN61496-1),
  Type 4 AOPD (prEN61496-2),
- SIL1, 2, 3 (EN61508-1 to -7)
  Application: EN954-1 categories B, 1, 2, 3, 4

**5.** The F3SJ-A has received certificates of UL listing for US and Canadian safety standards from the Third Party Assessment Body UL.

- Type 4 ESPE (UL61496-1),
  Type 4 AOPD (UL61496-2)

**6.** The F3SJ-A is designed according to the standards listed below. To make sure that the final system complies with the following standards and regulations, you are asked to design and use it in accordance with all other related standards, laws, and regulations. If you have any questions, consult with specialized organizations such as the body responsible for prescribing and/or enforcing machinery safety regulations in the location where the equipment is to be used.

- European Standards: EN415-4, EN692, EN693
- US Occupational Safety and Health Administration: OSHA 29 CFR 1910.212
- US Occupational Safety and Health Administration: OSHA 29 CFR 1910.217
- American National Standard Institute: ANSI B11.1 to B11.19
- American National Standard Institute ANSI/RIA 15.06
- Canadian Standards Association CSA Z142, Z432, Z434
- SEMI standard SEMI S2

## Precautions for Safe Use

Indication and meaning for safe use
Meanings of Signal Words
To ensure safe use of the F3SJ-A, signal words and an alert symbol are used in this catalog to indicate safety-related instructions. Because these instructions describe details very important to your safety, it is extremely important that you understand and follow the instructions. The signal words and alert symbol used in this catalog are shown below.

**⚠ WARNING**

Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally, there may by significant property damage.

**⚠ CAUTION**

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.

### Definition of Symbol

| | |
|---|---|
|  | Prohibited<br>Indicates a prohibited action. |

### Warning Labels

**For users**

**⚠ WARNING**

The FS3J must be installed, set, and integrated into the mechanical control system by a qualified technician who has received the appropriate training. Failure to make correct settings may prevent detection of people and result in serious injury.

When changing parameters with a setting tool (F39-GWUM or F39-MC21), the change must be made and the contents of the change must be managed by the person in charge of the system. Unintentional or mistaken parameter changes may prevent detection of people and result in serious injury.

**For machines**

**⚠ WARNING**

Do not use this sensor for machines that cannot possibly be stopped by electrical control. For example, do not use it for a pressing machine that uses full-rotation clutch. Otherwise, the machine may not stop before a person reaches the hazardous part, resulting in serious injury.

Do not use the auxiliary output or external indicator output for safety applications. Failure of the F3SJ may cause a person to go undetected, resulting in serious injury.

### For mounting

**⚠ WARNING**

Make sure to test the operation of the F3SJ after installation to verify that the F3SJ operates as intended. Do not operate the machine until the test has been completed and F3SJ operation has been verified. Unintended function settings may cause a person to go undetected, resulting in serious injury.

Make sure to secure the safety distance between the F3SJ and the hazardous parts. Otherwise, the machine may not stop before a person reaches the hazardous part, resulting in serious injury.

Install a protective structure so that the hazardous part of a machine can only be reached by passing through the sensor's detection zone. Install the sensors so that part of the person is always present in the detection zone when working in a machine's hazardous areas. If a person is able to step into the hazardous area of a machine and remain behind the F3SJ's detection zone, configure the system with an interlock function that prevents the machine from being restarted. Otherwise it may result in heavy injury.

Install the interlock reset switch in a location that provides a clear view of the entire hazardous area and where it cannot be activated from within the hazardous area.

The F3SJ cannot protect a person from an object flying from a hazardous area. Install protective cover(s) or fence(s).

When detection of an area has been disabled by the fixed blanking function, provide a protective structure around the entire area that will prevent a person from passing through it and reaching the hazardous part of the machinery. Failure to do so may prevent detection of people and result in serious injury.

After setting the fixed blanking function, be sure to confirm that a test rod is detected within all areas that require detection. Failure to do so may prevent detection of people and result in serious injury.

When the fixed blanking function or the floating blanking function is used, the diameter for the smallest detectable object becomes larger. Be sure to use the diameter for the smallest detectable object for the fixed blanking function or the floating blanking function when calculating the safety distance. Failure to do so may prevent the machinery from stopping before a person reaches the hazardous part of the machinery, and result in serious injury.

The muting and override functions disable the safety functions of the device. Additional safety measures must be taken to ensure safety while these functions are working.

Install muting sensors so that they can distinguish between the object that is being allowed to be pass through the detection zone and a person. If the muting function is activated by the detection of a person, it may result in serious injury.

Muting lamps (external indicators) that indicate the state of the muting and override functions must be installed where they are clearly visible to workers from all the operating positions.

Muting times must be precisely set according to the application by qualified personnel who have received appropriate training. In particular, if the muting time limit is to be set to infinity, the person who makes the setting must bear responsibility.

Use two independent input devices for the muting inputs.

Install the F3SJ, Muting Sensors, or a protective wall so that workers cannot enter hazardous areas while muting is in effect, and set muting times.

Position the switch that is used to activate the override function in a location where the entire hazardous area can be seen, and where the switch cannot be operated from inside the hazardous area. Make sure that nobody is in the hazardous area before activating the override function.

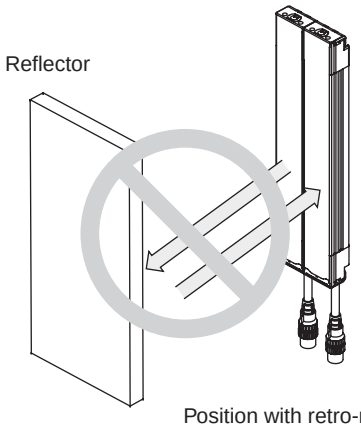
Install the sensor system so that it is not affected by reflective surfaces. Failure to do so may hinder detection, resulting in serious injury.

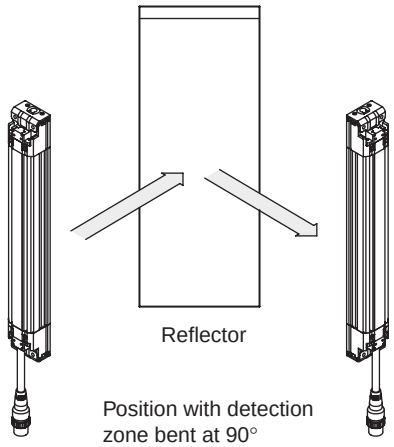
When using more than 1 set of F3SJ, install them so that mutual interference does not occur, such as by configuring series connections or using physical barriers between adjacent sets.

Make sure that the F3SJ is securely mounted and its cables and connectors are properly connected.

Make sure that no foreign material, such as water, oil or dust, enters the inside of the F3SJ while the cap is removed.

Do not use the sensor system with mirrors in as retro-reflective configuration. Doing so may hinder detection. It is possible to use mirrors to "bend" the detection zone to a 90-degree angle.




When using series connections, perform inspection of all connected F3SJs as instructed in the User's Manual.

### For wiring

**⚠ WARNING**

For PNP output, connect the load between the output and 0 V line.

For NPN output, connect the load between the output and +24 V line. Connecting the load between the +24 V and 0 V lines results in a dangerous condition because the operation mode is reversed to "ON when light is interrupted".

[For PNP output]
Do not short-circuit an output line to +24 V line. Otherwise, the output is always ON, creating a dangerous situation. Also, 0 V of the power supply must be grounded so that output should not turn ON due to grounding of the output line.
[For NPN output]
Do not short-circuit an output line to 0 V line. Otherwise, the output is always ON, creating a dangerous situation. Also, the +24 V line of the power supply must be grounded so that output does not turn ON due to grounding of the output line.

Configure the system by using the optimal number of control outputs that satisfy the requirements of the necessary safety category.

Do not connect each line of F3SJ to a DC power supply higher than 24 V+20%. Also, do not connect to an AC power supply.
Failure to do so may result in electric shock.

For F3SJ to comply with IEC 61496-1 and UL 508, the DC power supply unit must satisfy all of the following conditions:

- Must be within rated power voltage (24 VDC±20%).
- Must have tolerance against the total rated current of devices if it is connected to multiple devices.
- Must comply with EMC directives (industrial environment)
- Double or enhanced insulation must be applied between the primary and secondary circuits.
- Automatic recovery of overcurrent protection characteristics (reversed L sagging)
- Output holding time must be 20 ms or longer.
- Must satisfy output characteristic requirements for class 2 circuit or limited voltage current circuit defined by UL508.
- Must comply with EMC, laws, and regulations of a country or a region where F3SJ is used. (Ex: In EU, the power supply must comply with EMC Low Voltage Directive.)

Double or enhanced insulation from hazardous voltage must be applied to all input and output lines. Failure to do so may result in electric shock.

The cable extension length must be no greater than the specified length. Otherwise, the safety functions may fail to work properly, resulting in danger.

### Installation Conditions

Refer to *"Precautions for All Safety Sensors"* on page 242 for installation conditions.

**⚠ WARNING**

Make sure to secure the safety distance (S) between the F3SJ and the hazardous part. Otherwise, the machine may not stop before a person reaches the hazardous part, resulting in serious injury.

**Note:** The response time of a machine is the time period from when the machine receives a stop signal to when the machine's hazardous part stops.
Measure the response time on the actual system. Also, periodically check that the response time of the machine has not changed.

Refer to the "*Precautions for All Safety Sensors*" on page 242 for calculating the Safety distance.

### Prevention of Mutual Interference

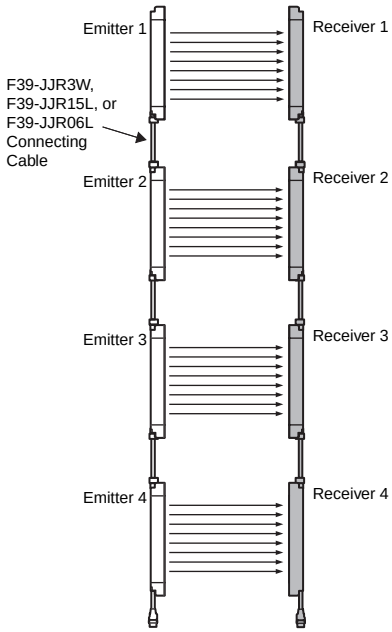
Do not use a sensor system in a reflective configuration.
Doing so may hinder detection.
Mirrors can be used change the optical route.

When using more than 1 set of F3SJ, install them so that mutual interference does not occur, such as by configuring series connections or using physical barriers between adjacent sets.

Mutual interference from other F3SJ is prevented in up to 3 sets without series connection.

### For series connection

Series connections can prevent mutual interference when multiple sensors are used. Up to 4 sets, 400 beams, can be connected (except for the F3SJ-A□-TS Series, for which up to 3 sets, 240 beams, can be connected). The emission of series-connected F3SJ is time-divided, so mutual interference does not occur and safety is ensured.




### No Series Connections

Refer to *"Precautions for All Safety" Sensors* on page 242 for information on preventing mutual interference of Safety Light Curtains that are not connected in series.

# Using Setting Tools

The following setting tools (sold separately) can be purchased in order to change or confirm various F3SJ-series parameters.

- F39-MC21 Setting Console
- F39-GWUM SD Manager Setting Support Software for the F3SJ

The Setting Console cannot be used with the F3SJ-A□-TS Series.

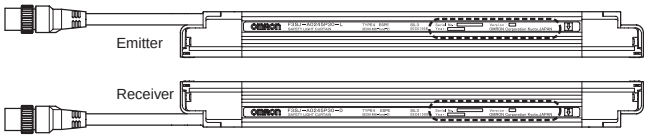
**⚠ WARNING**

The FS3J must be installed, set, and integrated into the mechanical control system by a qualified technician who has received the appropriate training. Failure to make correct settings may prevent detection of people and result in serious injury.

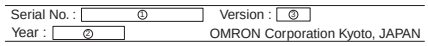
## F3SJ Versions

Setting tools can be used with Version 2 and later versions of the F3SJ. The setting tools cannot be used with Version 1.
The setting tools cannot be used even if a Version 1 F3SJ is combined in series with compatible F3SJ Units. (A communications error lockout will occur.)
Unfortunately, the F3SJ's version cannot be upgraded.
The F3SJ's version number appears on its label, as shown in the following diagram.

Location of the F3SJ's Version Number (Within Dashed-line Box)




Close-up View of Dashed-line Box




① : Serial number
② : Year of manufacture
③ : F3SJ's version number (Verify that the version is Version 2 or later.)

## Functions Editable with Setting Tools

❍: Can be used.
×: Cannot be used.

| Function or monitored item | | F39-MC21 Setting Console | F39-GWUM SD Manager Setting Support Software for the F3SJ |
|---|---|---|---|
| Settings for individual applications | Fixed blanking function ✻1 | ❍ | ❍ |
| | Floating braking function ✻1 | ❍ | ❍ |
| | Warning zone function ✻1 | ❍ | ❍ |
| | Muting function ✻2 (when using the muting system) | ❍ | ❍ |
| | Override function ✻2 (when using the muting system) | ❍ | ❍ |
| Indicator and I/O settings | Auxiliary output ✻2 | ❍ | ❍ |
| | Specified light beam output function ✻1 | × | ❍ |
| | External indicator output ✻2 | ❍ | ❍ |
| | Interlock function ✻2 | ❍ | ❍ |
| | External device monitoring function ✻2 | ❍ | ❍ |
| Changing detection distance | Change detection distance function ✻1 | ❍ | ❍ |
| Monitoring operation | Light intensity indicators ✻1 | ❍ | ❍ |
| | Ambient light intensity indicators ✻1 | ❍ | ❍ |
| | Status indicators ✻1 | × | ❍ |
| Maintenance information | Error log ✻1 | ❍ | ❍ |
| | Power ON time ✻1 | ❍ | ❍ |
| | Number of load switching operations ✻1 | ❍ | ❍ |
| Recovering settings | Recover settings function ✻1 | ❍ | ❍ |
| Other functions | Safety distance calculation function ✻1 | × | ❍ |
| | Power cable length calculation Function ✻1 | × | ❍ |
| | Rated response time check ✻1 | ❍ | ❍ |

**✻1.** These functions were newly added in Version 2. A setting tool can be used to enable these functions or read the function settings.
**✻2.** These functions can be used even without a setting tool. A setting tool can be used to make more detailed settings.

# Two Kinds of Setting Tools

The following accessories (sold separately) can be purchased in order to use various F3SJ-series functions and change settings.

- F39-MC21 Setting Console
  A Setting Console can easily make settings onsite.
- F39-GWUM SD Manager Setting Support Software for the F3SJ
  With this software, a personal computer can be connected to make settings. The SD Manager Setting Support Software for the F3SJ can make more detailed settings than the Setting Console.

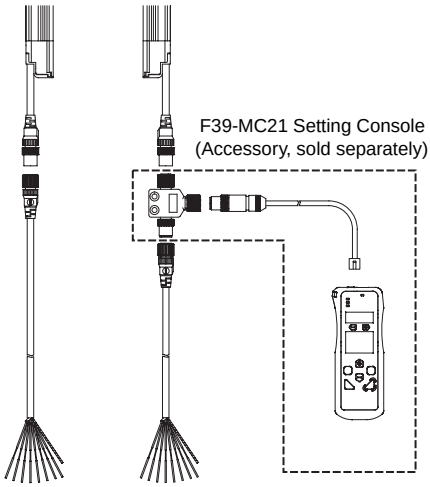
## Setting Console

The following items are included with the F39-MC21 Setting Console.

- Setting Console
- Branch Connector (with Connector Cap)
- Special Cable
- Special Cable with Plug
- Error Mode Label
- Instruction Manual

### Connecting the Setting Console

Connect the F3SJ to the Setting Console as shown in the following diagram. The Branch Connector can be used on either the emitter side or receiver side. After the F3SJ has been wired, turn ON the power and change parameters as required. If it is not possible to connect a branch connector because the connector is concealed by equipment or otherwise inaccessible, use the Special Cable with Plug to connect to the + and – communications lines. For details, refer to the F39-MC21 Instruction Manual.




## SD Manager Setting Support Software for the F3SJ

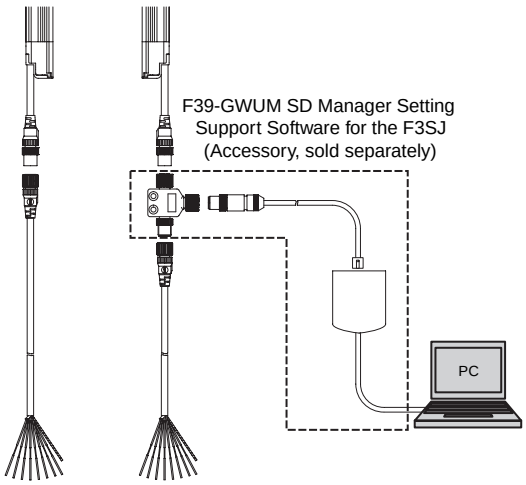
The following items are included with the F39-GWUM SD Manager Setting Support Software for the F3SJ.

- CD-ROM (SD Manager Setting Support Software for the F3SJ, Communications Unit Driver)
- Communications Unit
- Branch Connector (with Connector Cap)
- Special Cable
- Instruction Manual (Installation Guide)
- Special Cable with Plug

The F3SJ's operating status can be checked and its parameters can be changed in the SD Manager Setting Support Software for the F3SJ.

### Connecting the SD Manager Setting Support Software

Connect the F3SJ, Communications Unit, and personal computer as shown in the following diagram. The branch connector can be used on either the emitter side or receiver side. After the F3SJ has been wired, turn ON the power and start the Setting Support Software. If it is not possible to connect a branch connector because the connector is concealed by equipment or otherwise inaccessible, use the Special Cable with Plug to connect to the + and - communications lines. For details, refer to the SD Manager's Help function.



# Applications Supported by the Setting Tools

## Fixed Blanking Function

### Summary

Disables specific F3SJ light beams.

**⚠ WARNING**

When the fixed blanking function is used to disable detection in an area, install blocking structures or shielding to prevent passage into the entire hazardous area where detection has been disabled. Failure to do so may prevent detection of people and result in serious injury.

When an allowable range of light beams has been set for fixed blanking, the size of the smallest detectable object will be larger in the vicinity of interrupting objects. Calculate the safety distance to match the settings.

After setting the fixed blanking function, you must verify that the F3SJ detects a test rod at any position in the entire area where intrusion must be detected. Failure to do so may prevent detection of people and result in serious injury.

### Example Application

In this example, there is always an object such as a conveyor belt in the detection area, and we want to ignore the conveyor belt.

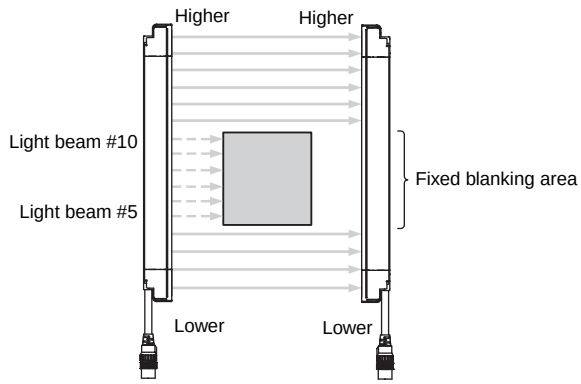
### Description of Functions

## Fixed Blanking Function

This function disables part of the F3SJ's detection area and maintains the control output's ON status even if there is an object in the disabled area.
The light beams set for fixed blanking must be one area of consecutive light beams and up to five areas can be set (areas 1 to 5). Fixed blanking cannot be set for all of the light beams.

## Setting the Fixed Blanking Area

Set the area that will be subject to fixed blanking.
An interrupting object can be placed in the detection area to perform teaching and specify light beams for manual settings.




**Note: 1.** When the Setting Console is being used, only one area can be set as a fixed blanking area.
**2.** When the SD Manager Setting Support Software is being used, up to five areas can be set as fixed blanking areas.

## Floating Blanking Function

### Summary

Increases the diameter of the F3SJ's smallest detectable object and turns OFF the control output when multiple objects are detected.

**⚠ WARNING**

When the floating blanking function is used, it increases the diameter of the F3SJ's smallest detectable object. Always use the larger diameter when calculating the safety distance. If the incorrect diameter is used in the calculation, the machinery may fail to stop before an operator reaches the hazardous area, resulting in serious injury.

After setting the floating blanking function, always verify that the F3SJ system operates as expected. Serious injury may result if an individual is not detected.

### Example Application

When there is a moving object with a fixed width in the detection area that we do not want to detect, the detection function can be disabled.

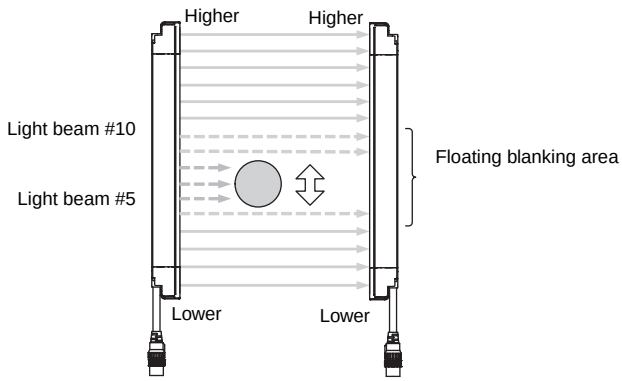
### Description of Functions

## Floating Blanking Function

This function increases the diameter of the smallest detectable object to allow passage of objects of a certain size or allow interrupting objects in multiple locations.

## Setting the Floating Blanking Area

When the Setting Console is being used, all of the light beams are set as the floating blanking area. When the SD Manager Setting Support Software is being used, just one area can be set but the range of the area can be specified. In the following example, the floating blanking area is set from the 5th light beam to the 10th light beam (counting from the bottom). An interrupting object can be placed in the detection area to perform teaching and specify light beams for manual settings.




## Floating Light Beams

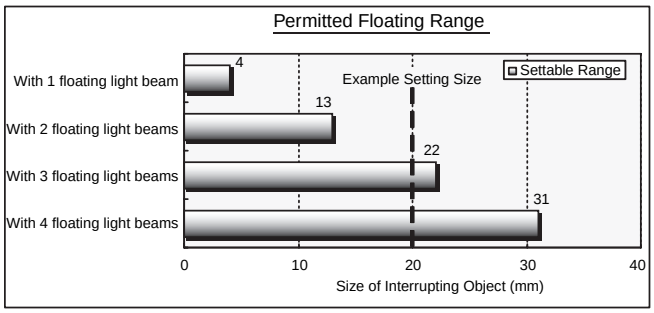
The following charts show the relationship between the number of floating light beams and the safety output operation (safety output not going OFF). Measure the size of the interrupting object (maximum diameter) and set the number of floating light beams so that the object's size is less than the corresponding dimension shown in the chart.

### Example Setting

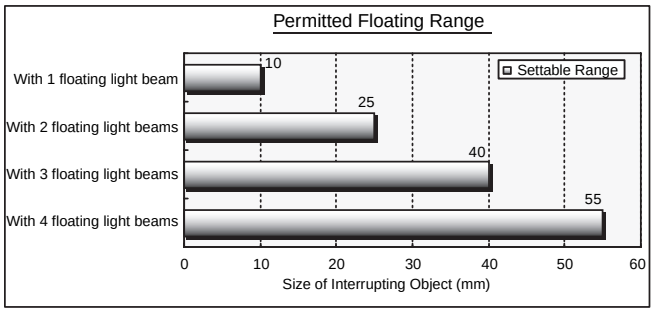
When an F3SJ-A□14 is being used with an interrupting object that is 20 mm in diameter, set three light beams as floating light beams. With this setting, the F3SJ's safety output will not turn OFF even if there is an interrupting object up to 22-mm wide in the floating blanking area.

### Effective Range vs. Number of Floating Light Beams

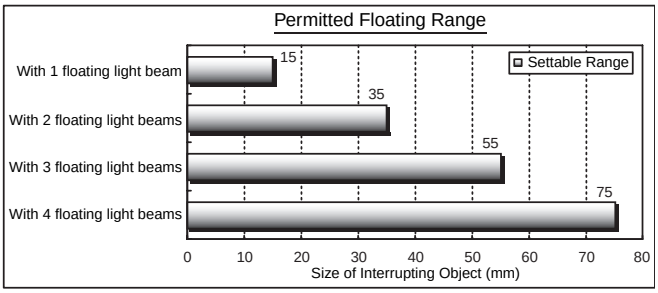
F3SJ-A□14 Series



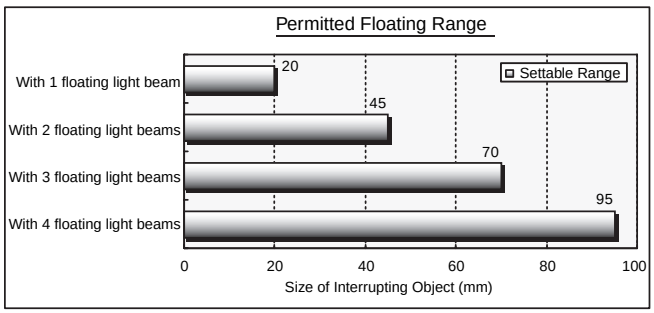

F3SJ-A□20 Series



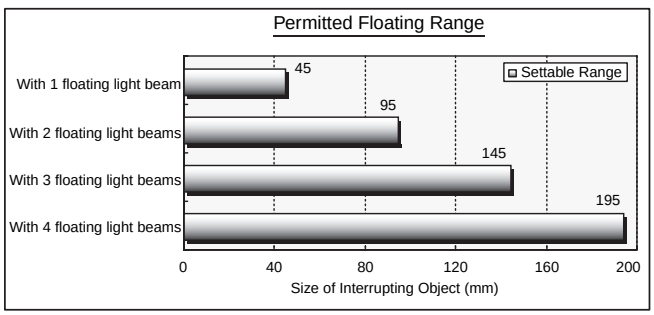

F3SJ-A□25 Series




F3SJ-A□30 Series




F3SJ-A□55 series




## Floating Blanking Mode

The floating blanking function has two operation modes.

1. Continuous Light Beam Mode
   The safety output will not go OFF if the interrupting object is smaller than the set size, although the safety output will go OFF if objects pass through several areas in the detection area.
   The floating blanking monitor function can be set in this mode. Refer to the User's Manual for details.
2. Discontinuous Light Beam Mode
   A light blockage is detected when the number of light beams blocked in the area is equal to or greater than the preset number of light beams.

## Warning Zone Function

### Summary

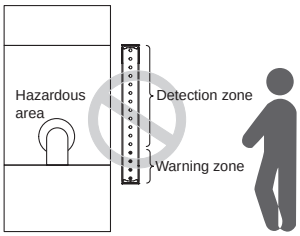
The detection zone can be divided into the detection zone and a warning zone.

**⚠ WARNING**

The warning zone output is not a safety output. Do not include this area in the safety distance calculation. Shortening the safety distance may result in serious injury.

The warning zone cannot be used for safety purposes. Always install the system so that the hazard is reached by passing through the detection zone.

The warning zone function can be used only when the F3SJ is installed horizontally. This function cannot be used when the F3SJ is installed vertically.




### Example Application

When an individual enters, a warning lamp lights or buzzer sounds without stopping the equipment.

### Description of Function

## Warning Zone Function

Use teaching to set the light beams that you want to set as the warning zone or manually specify the light beams from the lowest or highest beam. (See figures 1 and 2.)
To indicate that the warning zone is blocked, allocate the auxiliary output or external indicator output as the warning zone information.
The following settings cannot be made:

- Setting all light beams as the warning zone (figure 4)
- Setting a warning zone that does not include one of the outer light beams (figure 5)

If Safety Light Curtains are connected in series, and at least one of an F3SJ's light beams is a normal light beam, all of a Light Curtain's light beams can be set as a warning zone (figure 3).

### Example Warning Zone Settings (Figures 1 to 3)

Figure 1

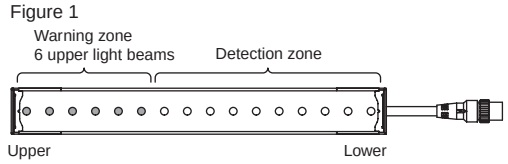



Figure 2

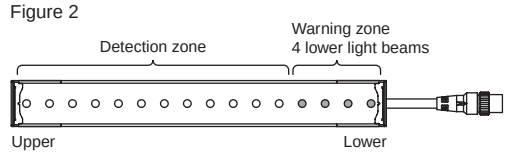
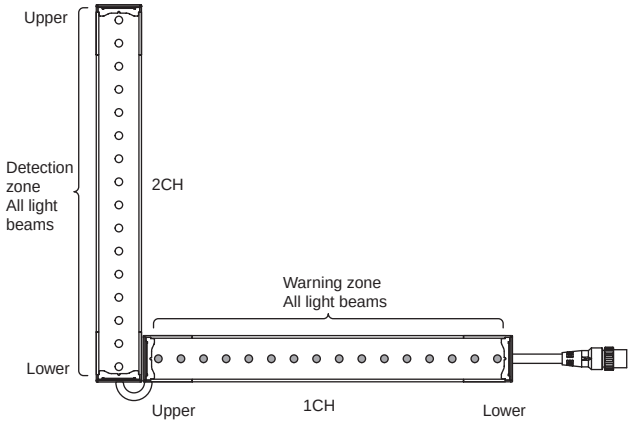



Figure 3




### Examples of Unacceptable Warning Zone Settings (Figures 4 and 5)

Figure 4

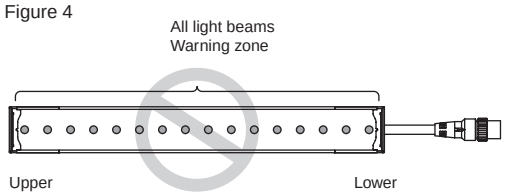
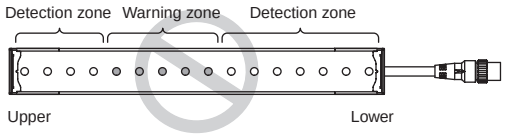
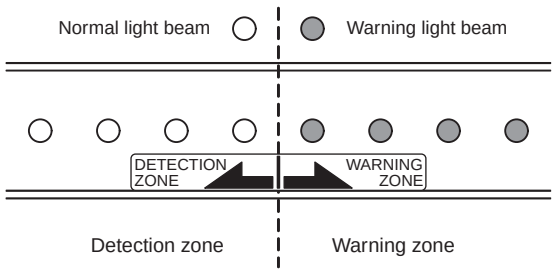



Figure 5




## Warning Zone Display Label

When the warning zone is set, affix this label to indicate which areas belong to the normal detection zone and the warning zone.



## Muting Function

### Summary

Makes settings related to the muting function.

**⚠WARNING**

The muting function disables the safety functions of the device. Additional safety measures must be taken to ensure safety while this function is working.

Install muting sensors so that they can distinguish between the object that is being allowed to be pass through the detection zone and a person.

Muting lamps (external indicators) that indicate the status of the muting function must be installed where they are clearly visible to workers from all the operating positions.

Muting times must be precisely set according to the application by qualified personnel who have received appropriate training. In particular, if the muting time limit is to be set to infinity, the person who makes the setting must bear responsibility.

Use two independent input devices for the muting inputs. (For the PNP output-type F3SJ, use a sensor with a PNP transistor output or N.O. contact. For the NPN output-type F3SJ, use a sensor with an NPN transistor output or N.O. type contact.)

To prevent a worker from entering the hazardous area while the muting function is engaged, install the F3SJ, muting sensor, and then a protective barrier and set a limited muting time.

### Example Applications

- Allowing only work pieces to pass into the conveyor entrance
- Operating the muting function in a specific area only
- Setting a different muting mode when standard muting is not appropriate for the application

### Description of Functions (See User's Manual for details.)

## Operation Modes

When the SD Manager Setting Support Software is being used, any one of the following three operation modes can be selected for the muting function.

**1.** Standard Muting Mode
This is the default operation mode, which is set when the F3SJ is shipped from the factory.
The muting function is enabled by turning ON muting inputs 1 and 2 with a time lag.

**Note:** Settings such as the muting time limit value can be changed.

**2.** Specialized Exit Muting Mode (Can be set with the SD Manager Setting Support Software only.)
The muting function is enabled by turning ON muting inputs 1 and 2 with a time lag.
Installation of the muting input sensors is simpler than standard mode because the Safety Light Curtain's blocked light status is used to end muting.

**3.** Position Detection Muting Mode (Can be set with the SD Manager Setting Support Software only.)
Sensors such as limit switches are used for the muting inputs and the muting function is enabled by turning muting input from OFF to ON and then turning muting input 2 from ON to OFF within time difference T1 max. Use hybrid redundant inputs such as a combination of an N.O. contact input and an N.C. contact input. (When using a PNP-output photoelectric switch, use L/ON operation on one side and D/ON operation on the other side.)
This mode is useful when you want to disable the F3SJ temporarily, such as when a person is placing an object at the conveyor entrance.

## Partial Muting (Muting area) Settings

The light beams controlled by the muting function can be specified with a setting tool. (When the F3SJ is shipped, all light beams are set.) The light beams can be specified by teaching/recording the blocked light beams as muting light beams or manually specifying the desired light beams.

# Indicator and I/O Settings

## Auxiliary Output (Non-safety) and External Indicator Output (Non-safety)

### Summary

A setting tool can be used to change the allocation of auxiliary outputs 1 and 2, and external indicator outputs 1 and 2.

**⚠ WARNING**

Do not use the auxiliary outputs or external indicator outputs for safety purposes. Serious injury may result if an output fails and a person is not detected.

### Example Applications

- Allocating a lockout output or warning zone output to an auxiliary output
- Connecting an external indicator to an auxiliary output and making it flash

An auxiliary output or external indicator output can be connected to an incandescent light to function as a broken-wire or short-circuit detector. Refer to the User's Manual for details.

### Output Operation Modes (when allocated to an auxiliary output or external indicator output)

| Output operation mode | Description of operation (Output will go ON in the following situation.) | Setting Console | SD Manager Setting Support Software |
|---|---|---|---|
| Control output | The control output is ON | ❍ | ❍ |
| Light intensity diagnosis ✻1 | The F3SJ is ON and the received light intensity is 100% to 130% of the threshold value for more than 10 seconds. | ❍ | ❍ |
| Error/Lockout | The F3SJ is in error or lockout status. | ❍ | ❍ |
| Muting/Override | The F3SJ is in muting or override status. | ❍ | ❍ |
| Blanking/Warning Zone ✻2 | The fixed blanking, floating blanking, or warning zone function is enabled. | ❍ | ❍ |
| Specified light beam output ✻3 | A specified light beam is blocked. | × | ❍ |
| Power ON time | The power ON time has exceeded the threshold value. | ❍ | ❍ |
| Warning zone ✻4 | Light is blocked in the warning zone. | ❍ | ❍ |
| Test input ON | The test input went ON. | ❍ | ❍ |
| Blanking light beam incident light | A fixed or floating light beam is receiving incident light. | ❍ | ❍ |
| Interlock | The F3SJ is in interlock status. | ❍ | ❍ |
| Muting error | The F3SJ is in muting error status. | ❍ | ❍ |
| Number of load switching operations exceeded | The number of load switching operations exceeded the threshold value. | ❍ | ❍ |
| Information trigger | An interlock, lockout, or muting error has occurred. | × | ❍ |
| Individual linked sensor output (channel 1) | Channel 1 control output is ON when Units are linked in series. | ❍ (Auxiliary output 1 only) | ❍ (Auxiliary output 1 only) |
| Individual linked sensor output (channel 2) | Channel 2 control output is ON when Units are linked in series. | ❍ (Auxiliary output 1 only) | ❍ (Auxiliary output 1 only) |
| Individual linked sensor output (channel 3) | Channel 3 control output is ON when Units are linked in series. | ❍ (Auxiliary output 1 only) | ❍ (Auxiliary output 1 only) |
| Individual linked sensor output (channel 4) | Channel 4 control output is ON when Units are linked in series. | ❍ (Auxiliary output 1 only) | ❍ (Auxiliary output 1 only) |

**Note:** When "specified light beam output" is allocated as the output operation mode for auxiliary output 1 or 2 or external indicator output 1 or 2, that mode cannot be allocated to the other output operations.

**✻1.** A light blockage was detected even though the output is not turned OFF because the blockage occurred at a light beam subject to fixed blanking, floating blanking, or muting. Blockages are also not processed during overrides.

**✻2.** The fixed blanking light beams or floating blanking light beams must be set.

**✻3.** The specified light beam must be set.

**✻4.** The warning zone light beams must be set.

# Changing the Detection Distance

## Change detection distance function

### Summary

The F3SJ's detection distance can be shortened.

### Example Application

The F3SJ's detection distance can be shortened to avoid affecting other photoelectric sensors.
When devices are installed close together, shortening the detection distance can reduce mutual interference.

### Description of Function

The detection distance can be set to 0.5 m, 1 m, 2 m, 3 m, 5 m, or MAX (either 7 m or 9 m).
The most suitable detection distance can be set to match the installation distance.

**Note:** MAX represents the rated detection distance.

# Monitoring Operation

## Received Light Intensity Indicator

### Summary

It is possible to read the F3SJ's received light intensity.

### Example Application

Adjust the light beams while checking the F3SJ's received light intensity.

### Description of Function

Indicates the F3SJ's received light intensity.
The F3SJ's received light intensity level can be checked with a setting tool.

## Ambient Light Intensity Indicator

### Summary

It is possible to read the intensity of the light received by the F3SJ from ambient sources, such as other photoelectric sensors.

### Example Application

Display the ambient light level while taking steps to reduce light interference form sources such as photoelectric switches in the area and neighboring F3SJ Units.

### Description of Function

Indicates the ambient light level at the F3SJ from other light sources such as photoelectric sensors.
This function can help identify the photoelectric sensors that are the source of the light interference and identify the light beams being affected by the ambient light.

# Other Functions

The F3SJ is also equipped with the following functions.
Refer to the User's Manual for details on using these functions.

- Status indicators
- Error log
- Power ON time
- Number of load switching operations
- Safety distance calculation function
- Power cable length calculation function
- Rated response time check function

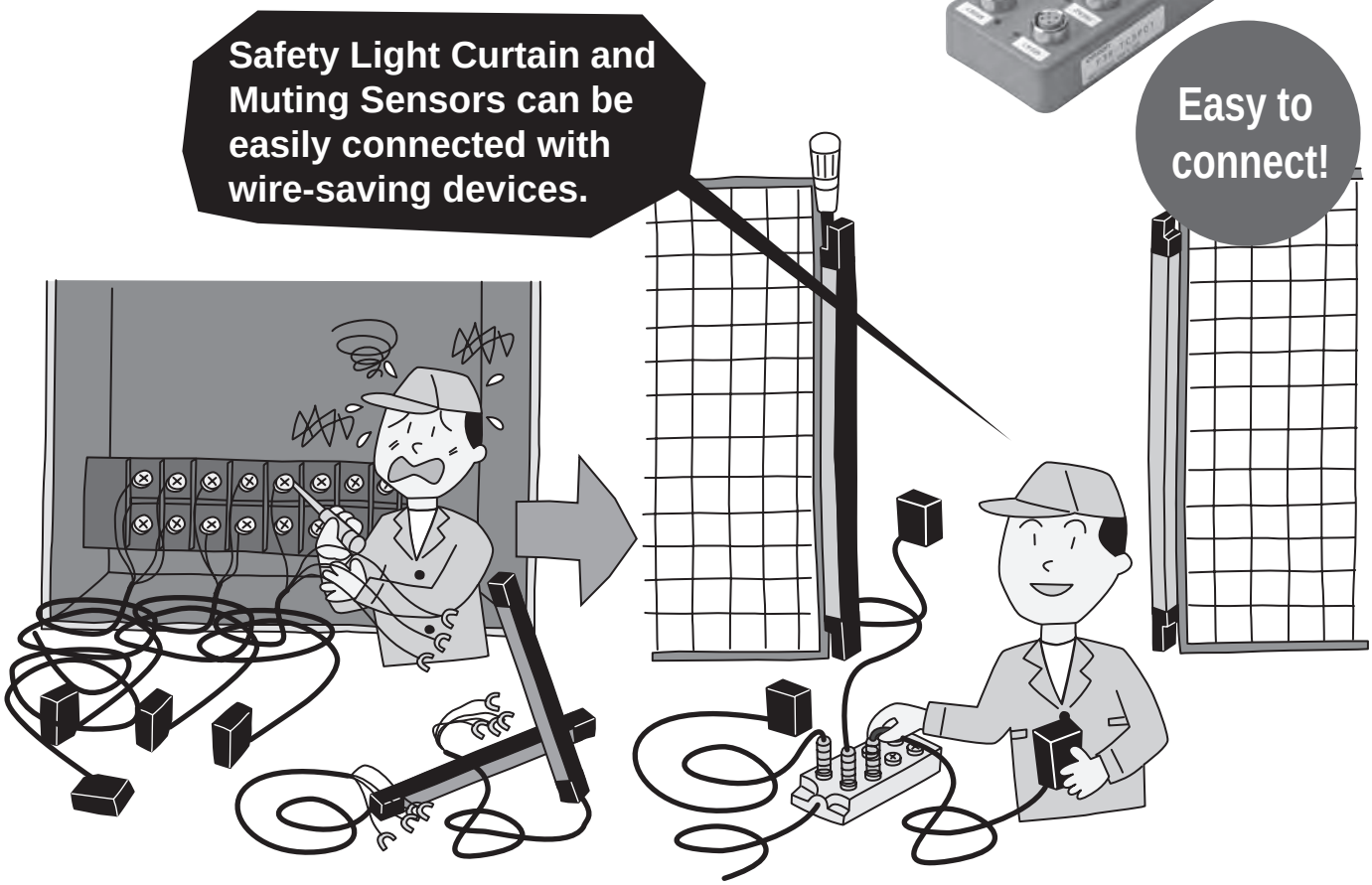
MEMO

# These new Wire-saving Devices enable ea

**To Connect to Muting Sensors: F39-TC5 Connector Terminal Box** ➡P360

## Significantly reduces the number of wires between the Safety Light Curtain and the Muting Sensors.






### ● Significantly reduces the number of wires between the Safety Light Curtain and Muting Sensors.

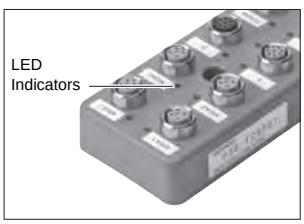
**Provides IP67 protection against water and dust.**



**Connection using connectors significantly reduces the wires.**

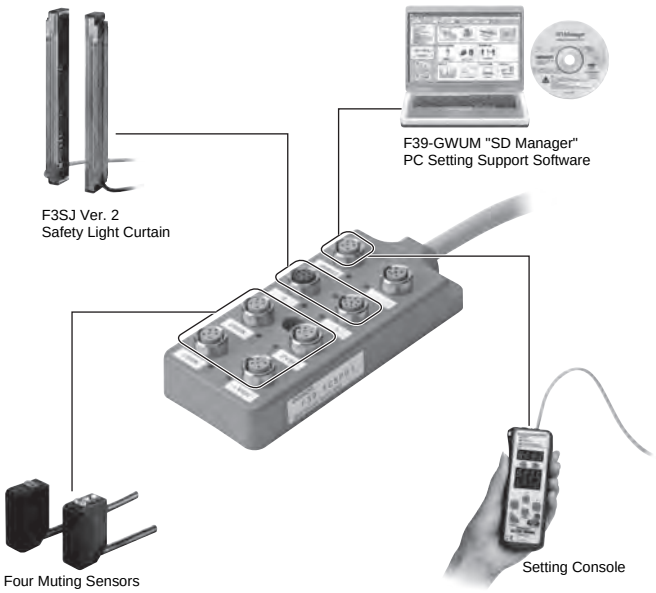


**The wiring status can be checked at a glance with the LED indicators.**




**The Setting Software can be connected, enabling on-site adjustment of the Light Curtain.**

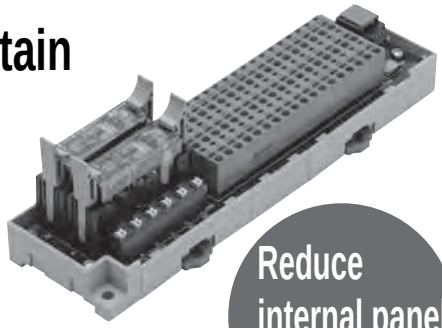




# sily using the muting function of the F3SJ.

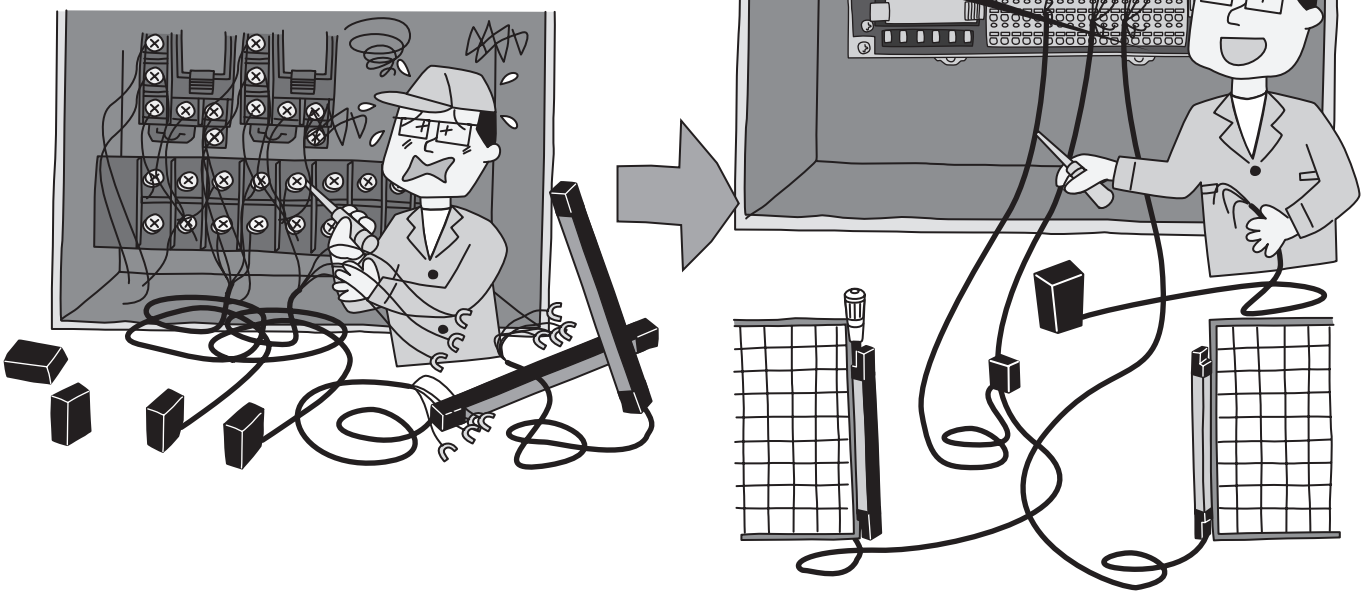
**To Connect to Safety Relays: F3SP-T01 Safety Terminal Relay** ➡P368

## Simplifies the wiring from the Safety Light Curtain to the Safety Relay outputs.



Use the Safety Terminal Relay to clear up messy wiring and inside the panel.
Simplifying the connections also helps prevent incorrect wiring.

Reduce internal panel wiring!

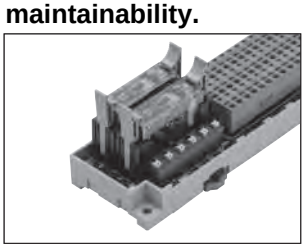


### ● Complicated wiring for safety system is made easy.

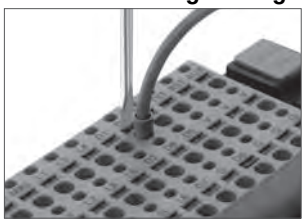
**Terminals are numbered to make it easy to check the terminal connections.**



**Replacement of relays is easy, improving maintainability.**

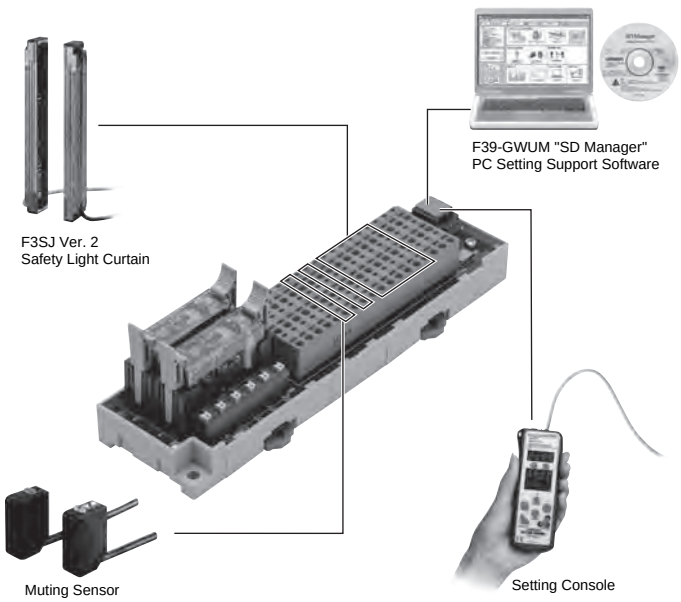


**Screw-less clamp terminals eliminate the need for extra tightening.**



**The Setting Software can be connected, enabling on-site adjustment of the Light Curtain.**





# Connector Terminal Box (Muting Terminals for F3SJ-A)
# F39-TC5

As of August 2008

## Significantly reduces amount of wiring between Safety Light Curtains and Muting Sensors.

- Provides IP67 protection against water and dust.
- Connection using connectors significantly reduces wiring work.
- The wiring status can be checked at a glance with the LED indicators.
- The Support Software can be connected, enabling on-site adjustment of a Light Curtain.



⚠ Be sure to read the *"Safety Precautions"* on page 366 and the *"Precautions for All Safety Sensors"* on page 242.

## Ordering Information

### Connector Terminal Box

| Classification | Applicable models | Specification | Type | Model |
|---|---|---|---|---|
| Muting Terminals | F3SJ-A□□□□P□□ | PNP | Model with Muting Sensor Output Mode | **F39-TC5P01** |
| | | | Model with Override Mode | **F39-TC5P02** |
| | F3SJ-A□□□□N□□ | NPN | Model with Muting Sensor Output Mode | **F39-TC5N01** |
| | | | Model with Override Mode | **F39-TC5N02** |

### Optional Accessories (Sold separately)

| Classification | Appearance | Model | Number per box |
|---|---|---|---|
| Short-circuit Connector |  | **F39-CN8** | --- |
| Waterproof Covers |  | **XS2Z-22** | 50 |

**Note:** One short-circuit connector is included with the F39-T□01 for Muting Sensors.
Three waterproof covers are included with a Connector Terminal Box with Muting Sensor Output Mode (F39-TC5□01) and four waterproof covers with a Connector Terminal Box with Override Mode (F39-TC5□02).
Order the above accessories only as spare parts.

## Specifications (Refer to Instruction Sheet for details.)

### Ratings

| | |
|---|---|
| **Rated voltage** | 24 VDC ±20% (at ambient temperature of 20°C) |
| **Rated current** | Power line: 2.4 A, Signal line: 0.3 A |

### Characteristics

| | |
|---|---|
| **Contact resistance** | 40 mΩ max. (connector section) |
| **Insulation resistance** | After applying 500 VDC for 60 s: 100 MΩ min. |
| **Vibration resistance** | Speed: 10 Hz to 500 Hz to 10 Hz in 20 minutes.<br>Simple vibration with full amplitude of 1.52 mm or 98 $m/s^2$ (whichever has the smaller amplitude) for two hours each in three directions X, Y, and Z (total of 6 hours).<br>Measured while connector is connected. |
| **Shock resistance** | 490 $m/s^2$ for 11 ms three times each along three axes, six directions X, Y, and Z (total of 18 times).<br>Measured while connector is connected. (MIL-STD-202F Test 213B, Condition A) |
| **Ambient operating temperature** | –25 to 70°C (with no icing or condensation) |
| **Ambient operating humidity** | 25% to 85% (with no icing or condensation) |
| **Degree of protection** | IP67 |
| **Accessories** | Short-circuit connector (models with Muting Sensor outputs only), waterproof cover |

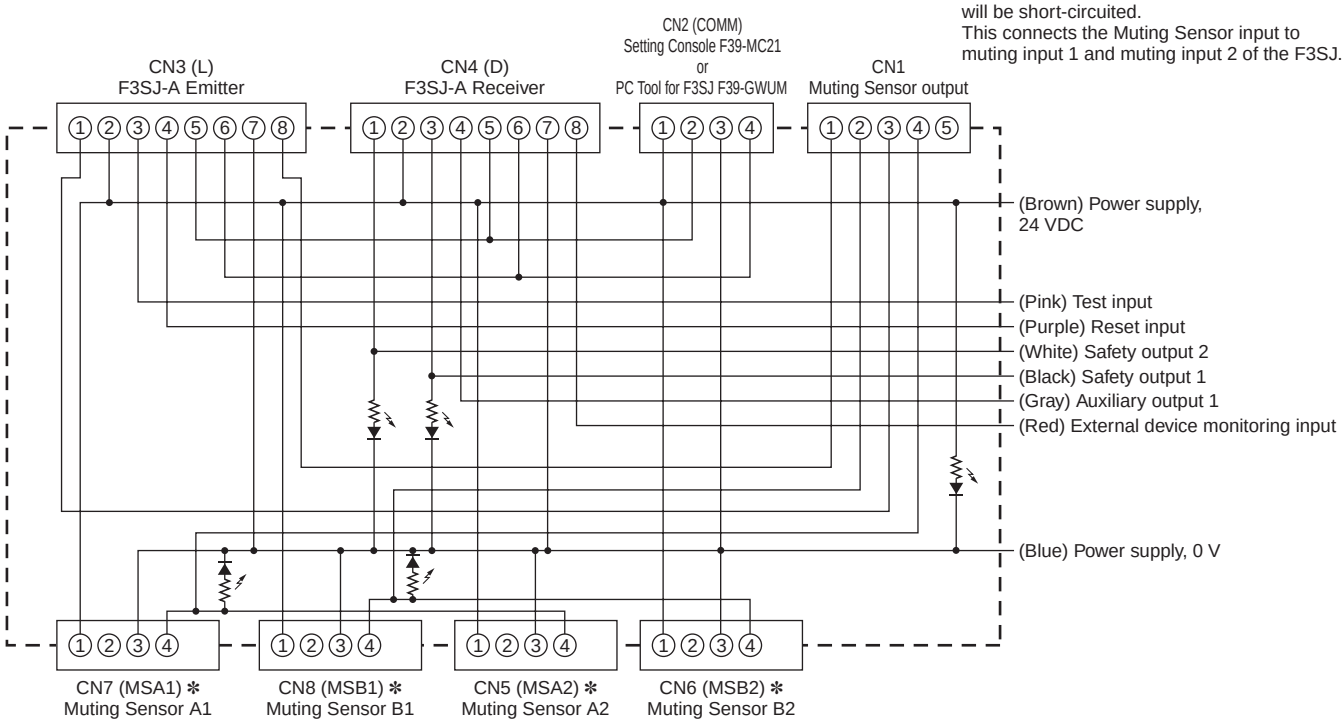
# Connections

## Internal Circuit Diagrams

### PNP

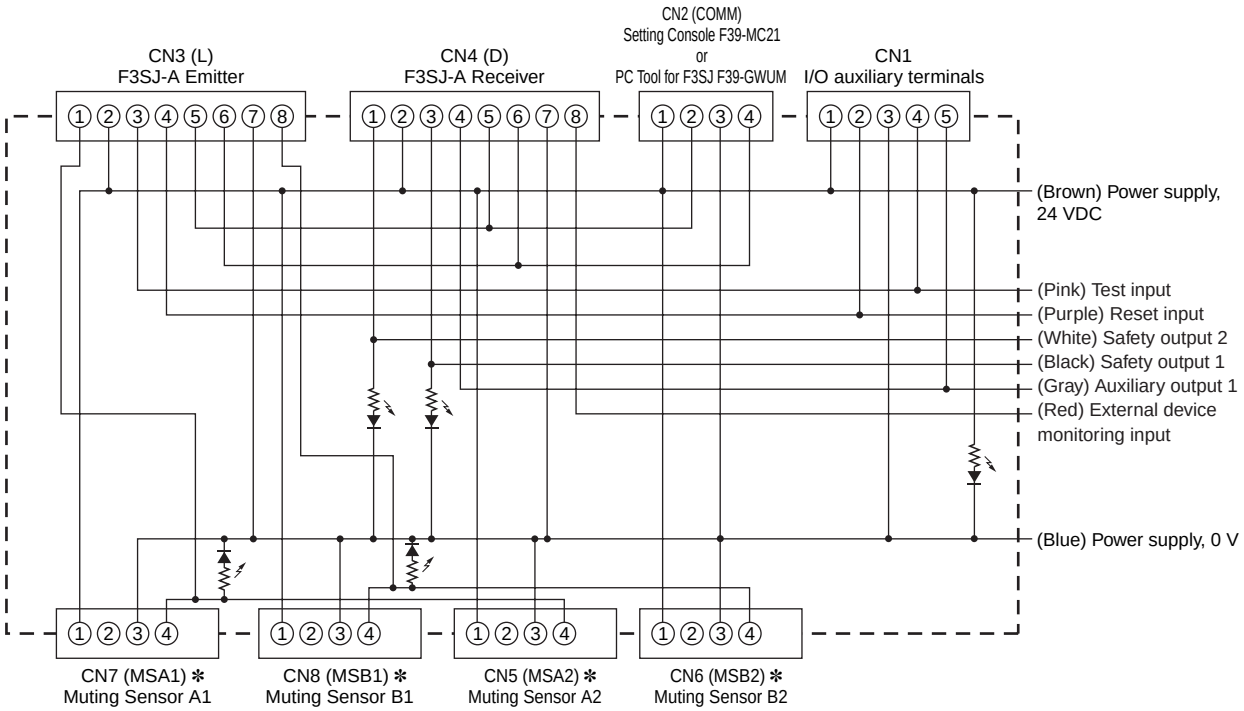
#### Model with Muting Sensor Output Mode F39-TC5P01

Note: When a short-circuit connector is connected to CN1, terminals 1 and 2, and terminals 3 and 4 will be short-circuited.
This connects the Muting Sensor input to muting input 1 and muting input 2 of the F3SJ.




✻ Use the following connecting cable to connect the Muting Sensors:
M12, 4-pin connector (Pin 1: +24 V, Pin 2: Not used, Pin 3: 0 V, Pin 4: Output)
When using a Through-beam Photoelectric Sensor, use an XS2R-D426-□11-F Y-joint with Socket and Plug or similar product to connect the transmitter and receiver.

#### Model with Override Mode F39-TC5P02

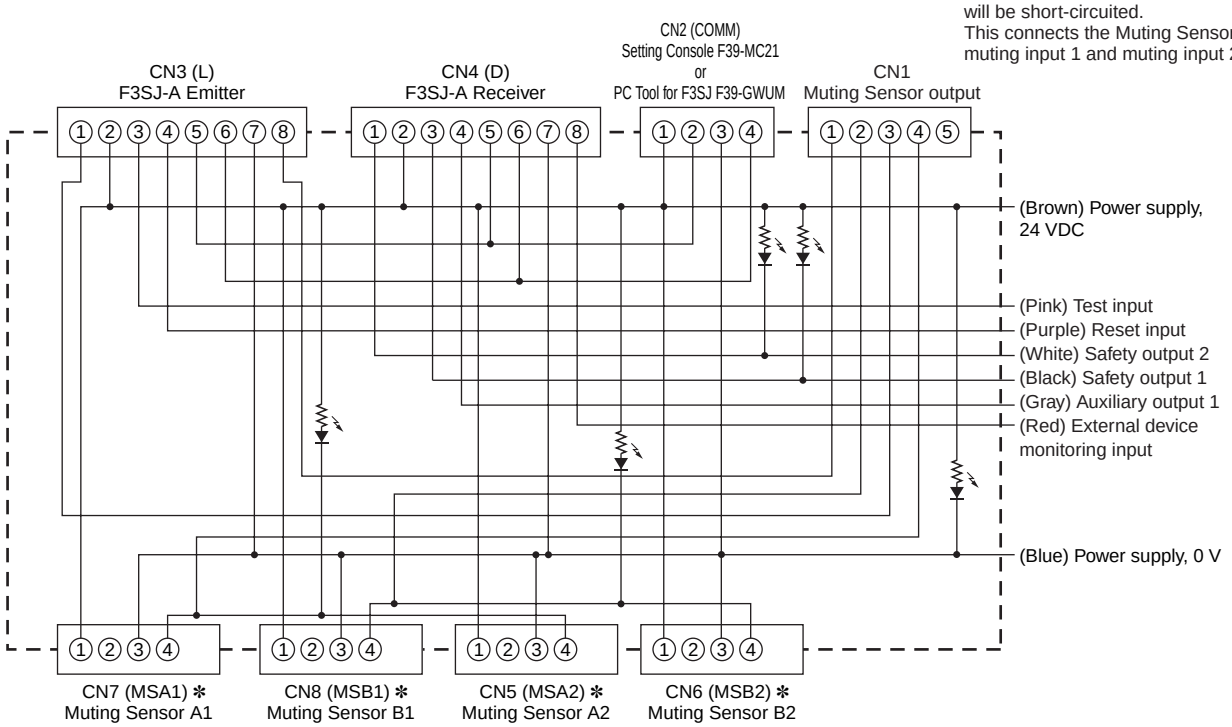



✻ Use the following connecting cable to connect the Muting Sensors:
M12, 4-pin connector (Pin 1: +24 V, Pin 2: Not used, Pin 3: 0 V, Pin 4: Output)
When using a Through-beam Photoelectric Sensor, use an XS2R-D426-□11-F Y-joint with Socket and Plug or similar product to connect the transmitter and receiver.

## NPN

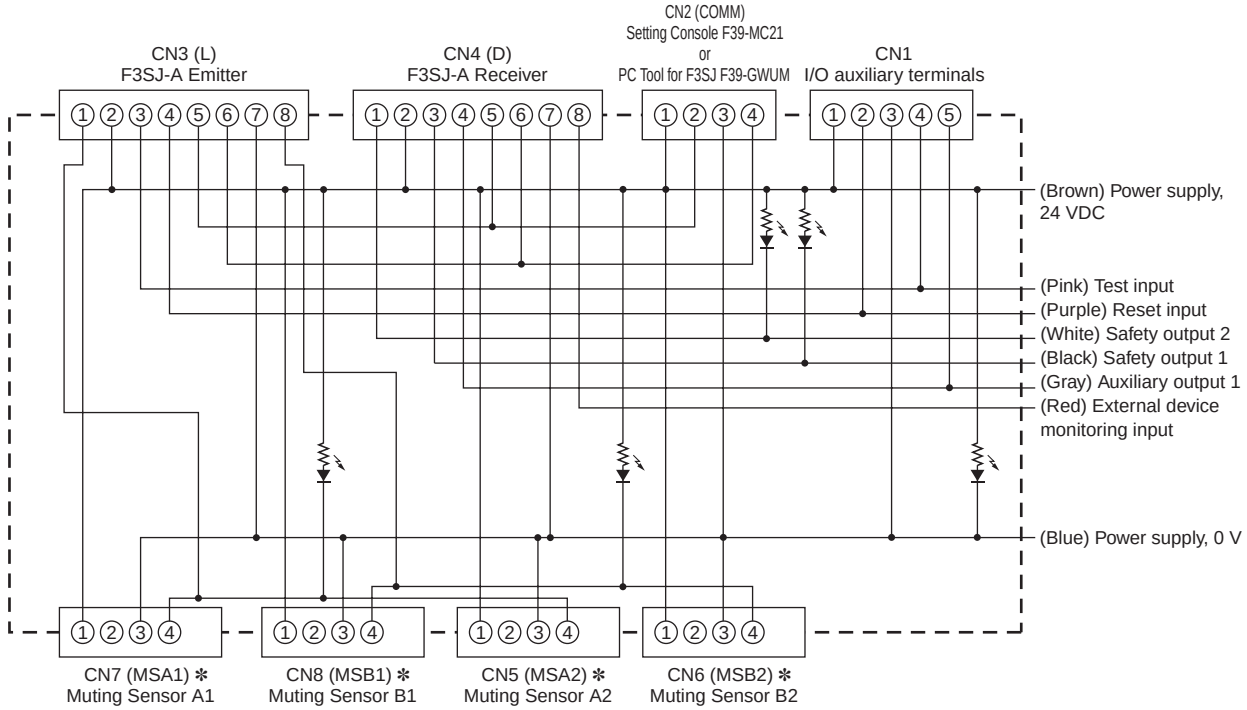
### Model with Muting Sensor Output Mode F39-TC5N01

Note: When a short-circuit connector is connected to CN1, terminals 1 and 2, and terminals 3 and 4 will be short-circuited.
This connects the Muting Sensor input to muting input 1 and muting input 2 of the F3SJ.




✻ Use the following connecting cable to connect the Muting Sensors:
M12, 4-pin connector (Pin 1: +24 V, Pin 2: Not used, Pin 3: 0 V, Pin 4: Output)
When using a Through-beam Photoelectric Sensor, use an XS2R-D426-□11-F Y-joint with Socket and Plug or similar product to connect the transmitter and receiver.

### Model with Override Mode F39-TC5N02

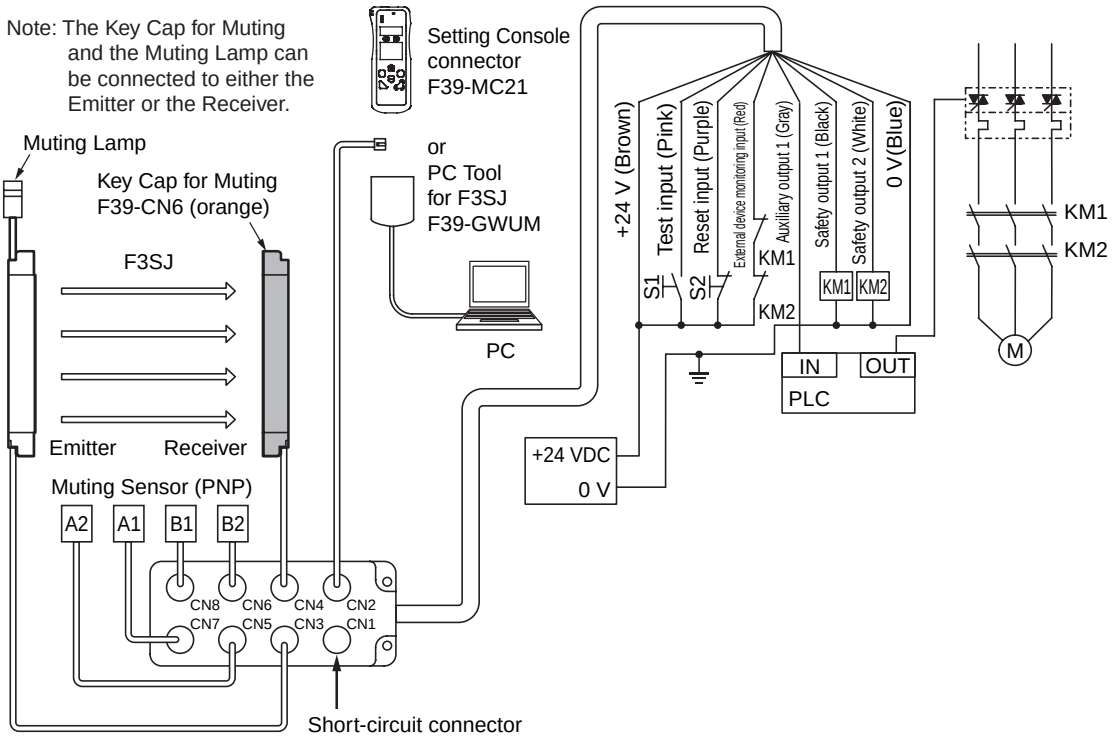



✻ Use the following connecting cable to connect the Muting Sensors:
M12, 4-pin connector (Pin 1: +24 V, Pin 2: Not used, Pin 3: 0 V, Pin 4: Output)
When using a Through-beam Photoelectric Sensor, use an XS2R-D426-□11-F Y-joint with Socket and Plug or similar product to connect the transmitter and receiver.

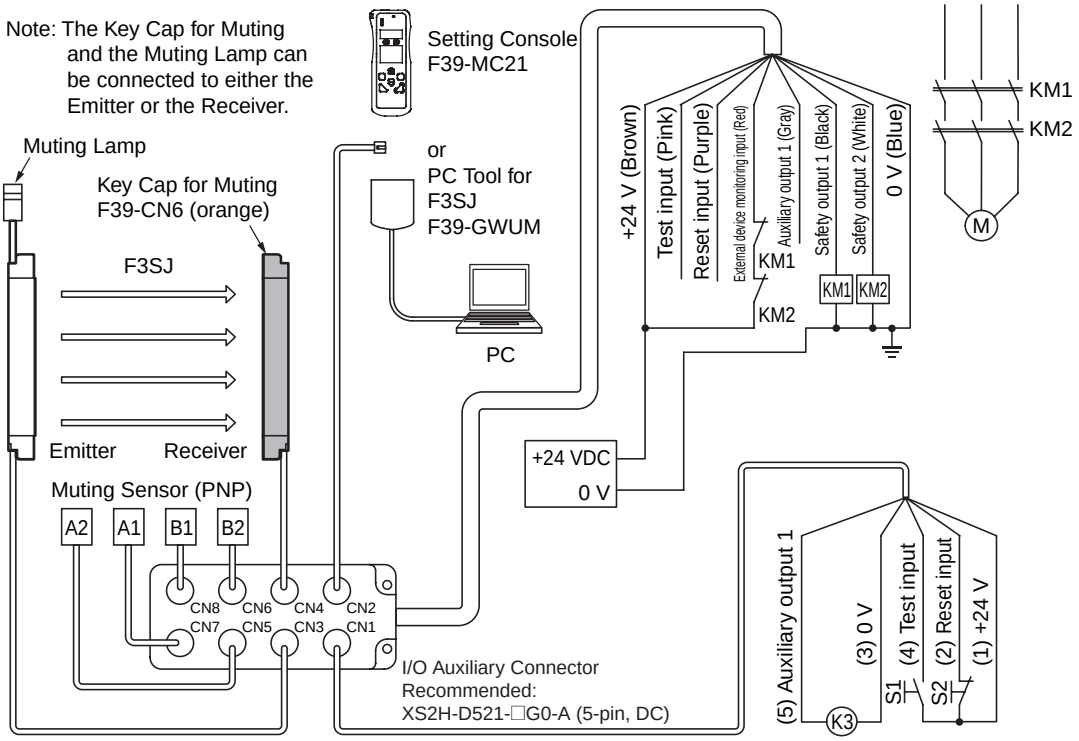
## Wiring Diagrams

### PNP

#### Model with Muting Sensor Output Mode F39-TC5P01

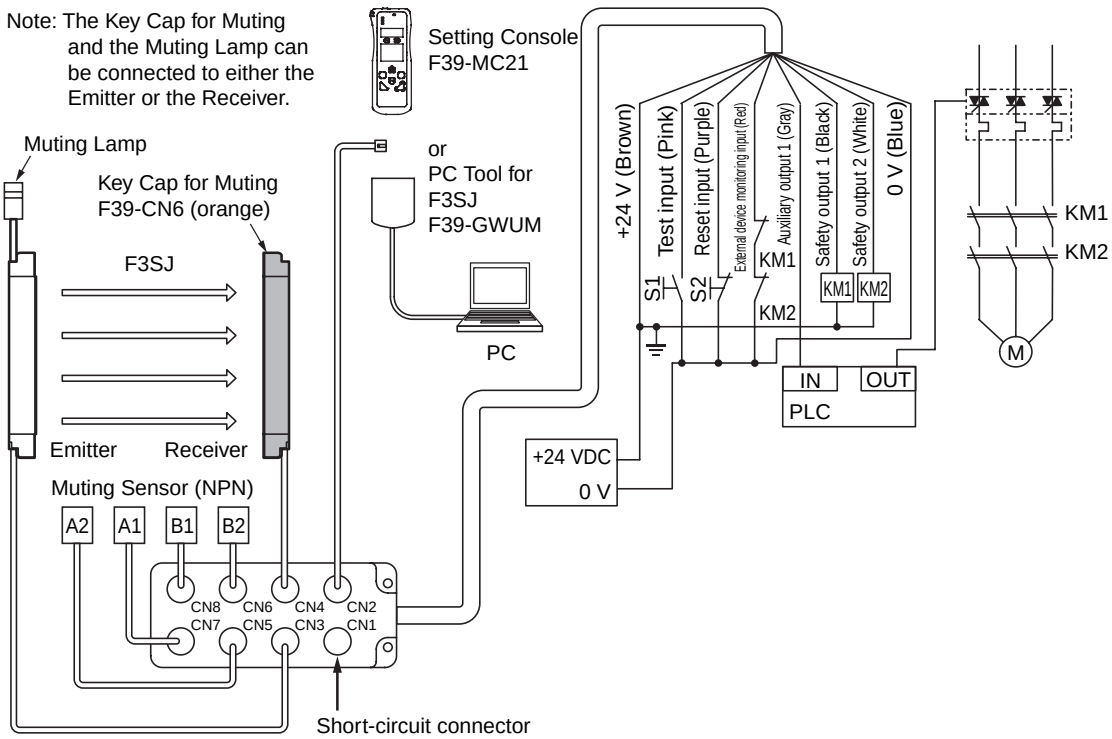



#### Model with Override Mode F39-TC5P02

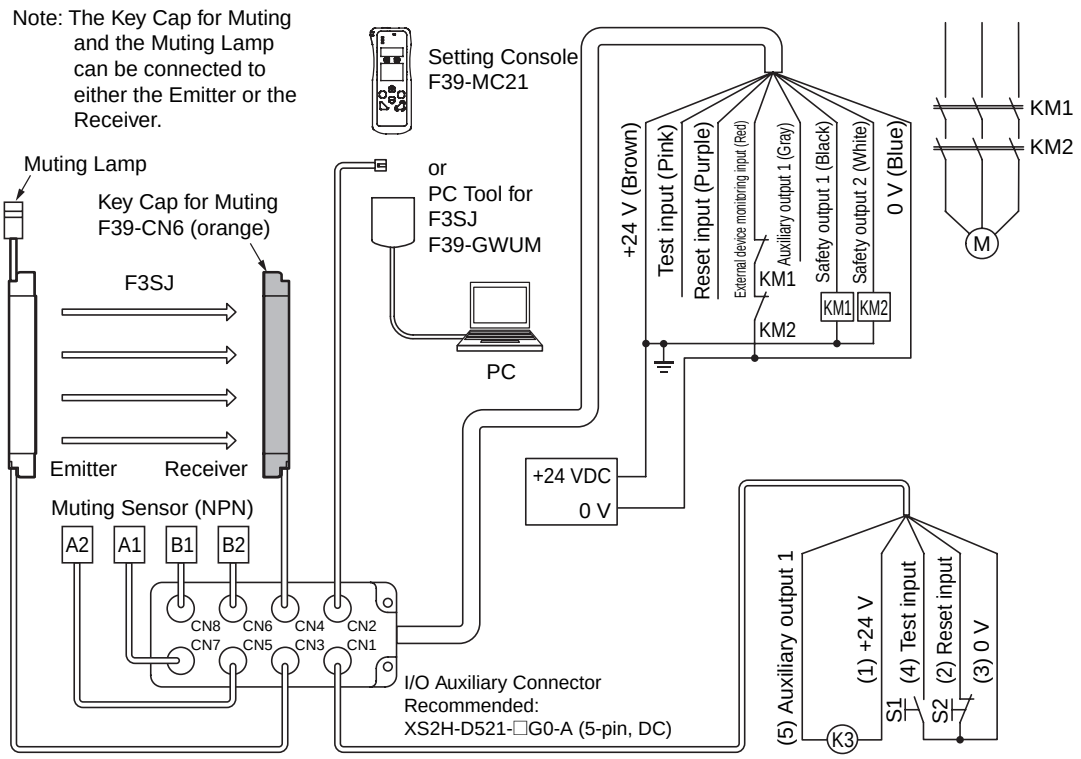


## NPN

### Model with Muting Sensor Output Mode F39-TC5N01



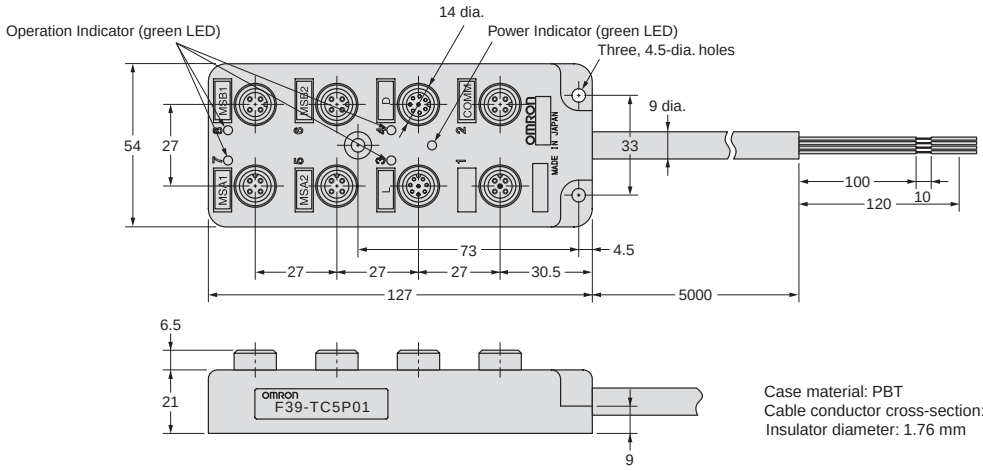

### Model with Override Mode F39-TC5N02



# Dimensions

(Unit: mm)

**F39-TC5P01**
**F39-TC5P02**
**F39-TC5N01**
**F39-TC5N02**







Case material: PBT
Cable conductor cross-section: 0.34 mm$^2$
Insulator diameter: 1.76 mm

## Safety Precautions

**⚠ WARNING**

The muting and override functions disable equipment safety functions. Use separate procedures to ensure safety when the muting and override functions are operating.

Position the Muting Sensors so that a distinction can be made between the entry of an object or a human. If the muting function were to operate when a human passed through, it may cause serious injury.

Install a Muting Lamp where it can be seen from all work locations, so that workers can check the status of the muting and override functions.

Muting times must be precisely set according to the application by qualified personnel who have received appropriate training. In particular, if the muting time limit is to be set to infinity, the person who makes the setting must bear responsibility.

Use two independent input devices for the muting inputs.

Install the F3SJ, Muting Sensors, or a protective wall so that workers cannot enter hazardous areas while muting is in effect, and set muting times.

Install override switches where they can be seen from the hazardous area, and where they cannot be operated from within the hazardous area. Before starting an override, check to make sure that nobody is within the hazardous area.

### Precautions for Safe Use

#### Installation Conditions

- Connector tightening torque: 0.39 to 0.49 N·m
- Panel mounting tightening torque: 0.6 to 0.8 N·m
  (use metric 4 screws)

#### Handling

- Make sure that the power is turned OFF before connecting or disconnecting the connector.
- Make sure that fasteners are tightened properly by hand. (0.39 to 0.49 N·m)
  The use of pliers may cause damage. If the screws are not tightened properly, the degree of protection may not be obtained, and the screws may come loose from vibration.
- If the cables are connected with the polarity reversed, the load will not operate, or the operation indicator will not light.
- Make sure that signal lines are always connected through a load.
- Use Sensors that meet the specifications.
- Do not pull on the connectors and cables. Doing so may damage the connector or break the cable.
- To avoid breaking the cable and damaging the connector, install them in a location where there is no danger of stepping on them. If you must install them in a location where they might be stepped on, place a protective cover on them.
- When installing the product, do not bend the cable where it is connected to the product.
- If you must bend the cable, make sure that the bend radius is greater than 60 mm.
- If you are not going to install Sensors and switches, place waterproof covers (XS2Z-22) on the connectors to protect the contact surface.

#### Storage

Observe the following points when storing the product for an extended period of time.

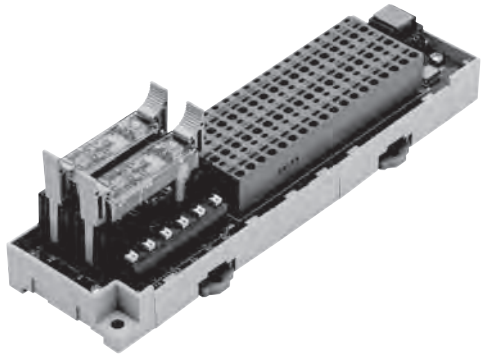
1. Make sure that the storage location is well protected against dust and humidity.
2. Do not store the product close to areas where ammonia or sulfurization gas is generated.

MEMO

# F3SP-T01

## Simplifies wiring from Safety Light Curtains to the Safety Relay outputs.

- Simplifies wiring inside the panel and helps prevent incorrect wiring.
- Terminals are numbered to make it easy to check terminal connections.
- Replacement of relays is easy, improving maintainability.
- Screw-less clamp terminals eliminate the need for extra tightening.
- The Support Software can be connected, enabling on-site adjustment of Light Curtains.



⚠ Be sure to read the *"Safety Precautions"* on page 375 and the *"Precautions for All Safety Sensors"* on page 242.



## Ordering Information

### Safety Terminal Relays

| Type | Applicable models | Model |
|---|---|---|
| Safety Terminal Relay | F3SJ-A□□□□P□□ | **F3SP-T01** |

### Optional Accessories (Sold Separately)

| Type | Model |
|---|---|
| Cable for connecting Support Software (cable length: 1.5 m) | **E39-Z12-1** |
| Replacement Relay | **G7SA-3A1B** |

## Specifications (Refer to Instruction Manual for details.)

### Ratings

#### Power supply

| | |
|---|---|
| **Rated voltage** | 24 VDC+10%/−15% |
| **Rated power consumption** | DC 1.7 W max. (not including sensor's power consumption) |

#### Contacts

| | |
|---|---|
| **Rated load** | 250 VAC 3 A, resistive load<br>30 VDC 3 A, resistive load |
| **Rated current** | 3 A |
| **Applicable Relays** | G7SA-3A1B: 24 VDC |

### Characteristics

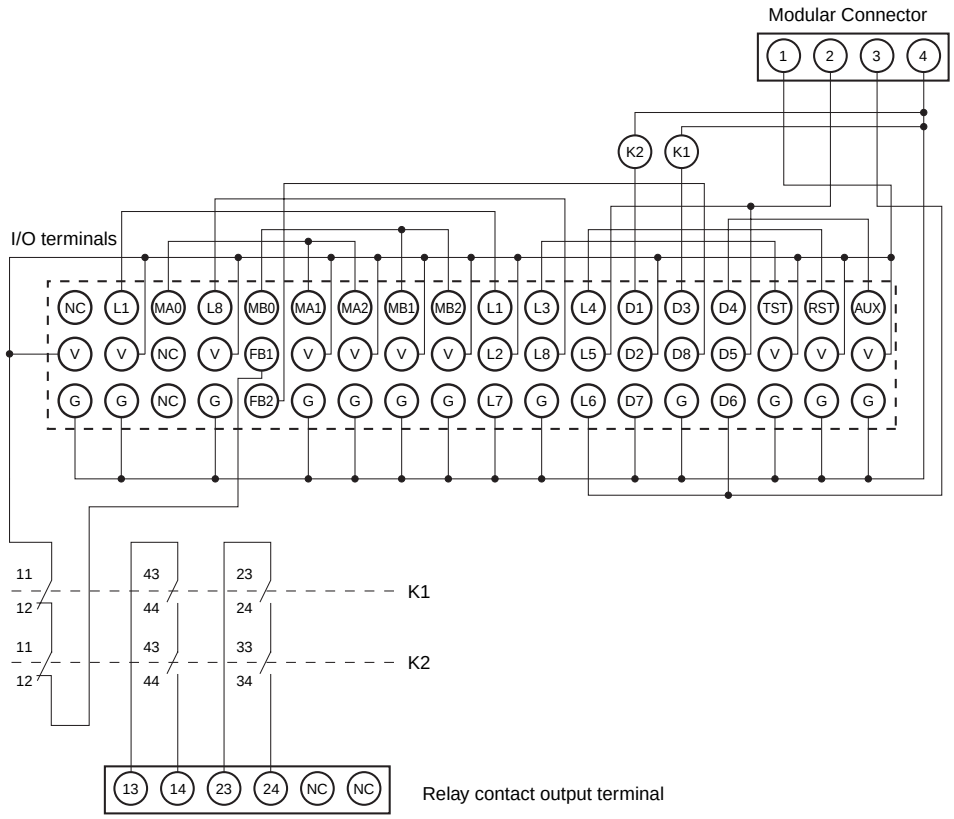
| | |
|---|---|
| **Operation time** | 100 ms max.<br>(not including sensor's response time) |
| **Response time** | 10 ms max.<br>(not including sensor's response time) |
| **Vibration resistance** | 10 to 55 to 10 Hz<br>Single amplitude: 0.35 mm<br>(Double amplitude: 0.7 mm) |
| **Shock resistance** | Destruction: 300 m/s$^2$, Malfunction: 100 m/s$^2$ |
| **Ambient operating temperature** | −10 to 55°C |
| **Ambient operating humidity** | 35 to 85% |
| **Weight** | Approx. 215 g |

#### Durability

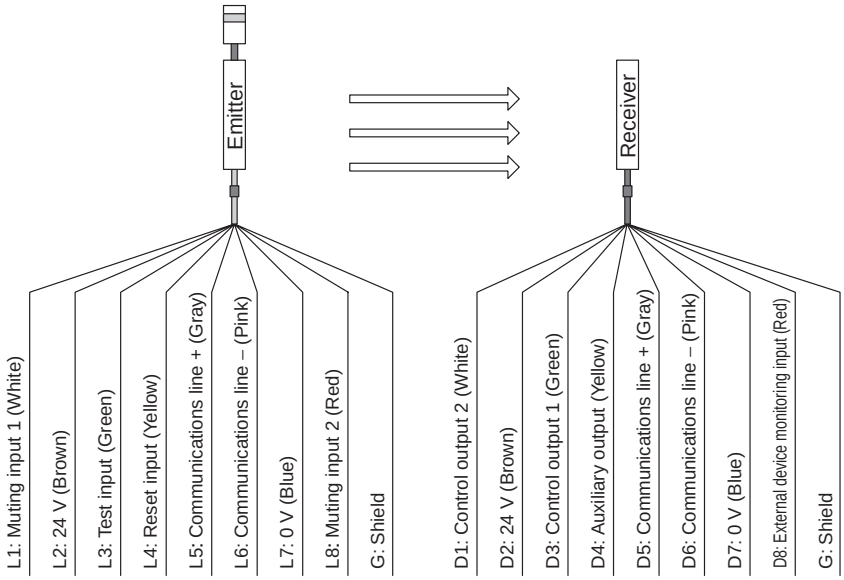
| | |
|---|---|
| **Electrical durability** | 100,000 operations min.<br>Rated load<br>Switching frequency: 1,800 operations/h |
| **Mechanical durability** | 5,000,000 operations min.<br>Switching frequency: 7,200 operations/h |

# Connections

## Internal Circuit Diagrams

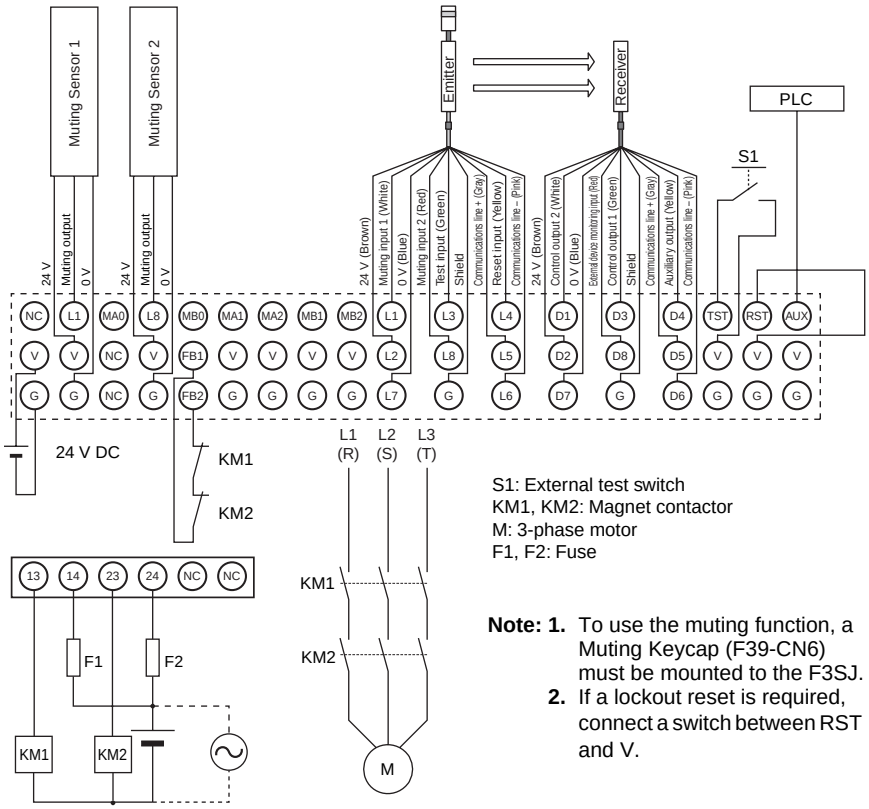



### Wiring Diagrams



## Wiring Example

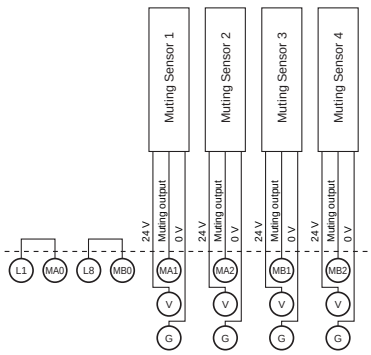
**The following example is for when two muting sensors are connected in the auto reset mode, and the external device monitoring function is enabled.**




S1: External test switch
KM1, KM2: Magnet contactor
M: 3-phase motor
F1, F2: Fuse

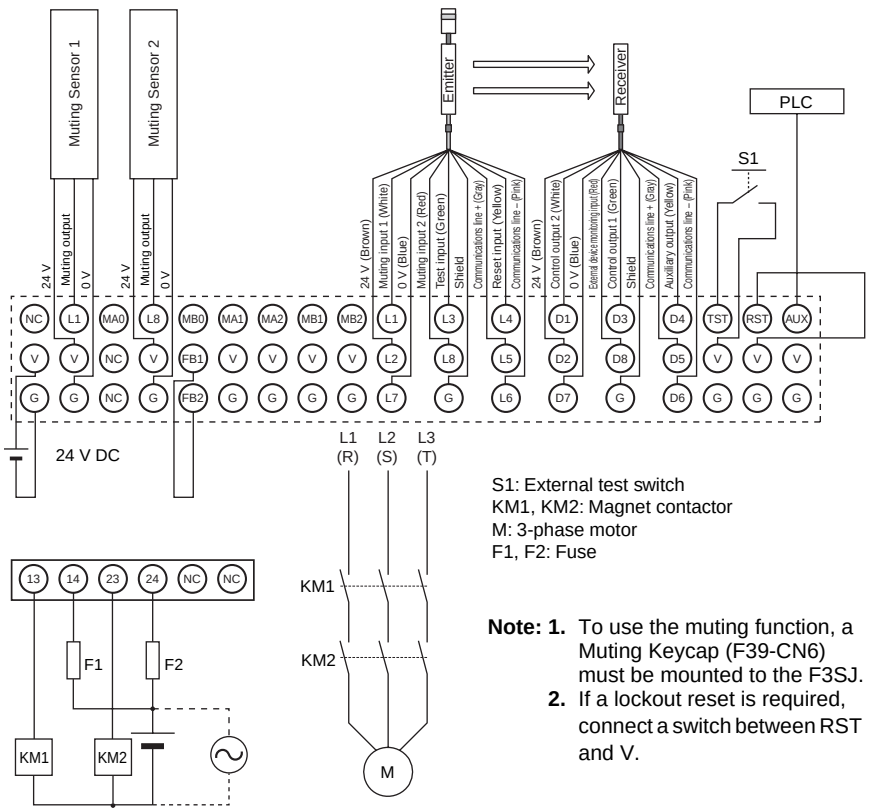
**Note: 1.** To use the muting function, a Muting Keycap (F39-CN6) must be mounted to the F3SJ.
**2.** If a lockout reset is required, connect a switch between RST and V.

### Connecting Four Muting Sensors




**Note:** If you are connecting four muting sensors, connect the sensor outputs to MA1, MA2, MB1, and MB2. Also short-circuit MA0 to L1, and MB0 to L8.

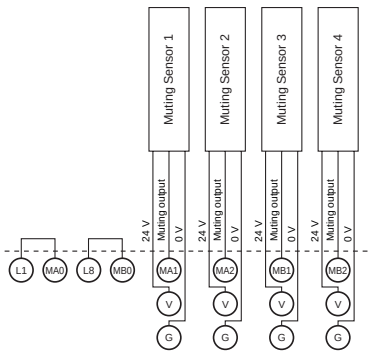
**The following example is for when two muting sensors are connected in auto reset mode, and the external device monitoring function is disabled.**




S1: External test switch
KM1, KM2: Magnet contactor
M: 3-phase motor
F1, F2: Fuse

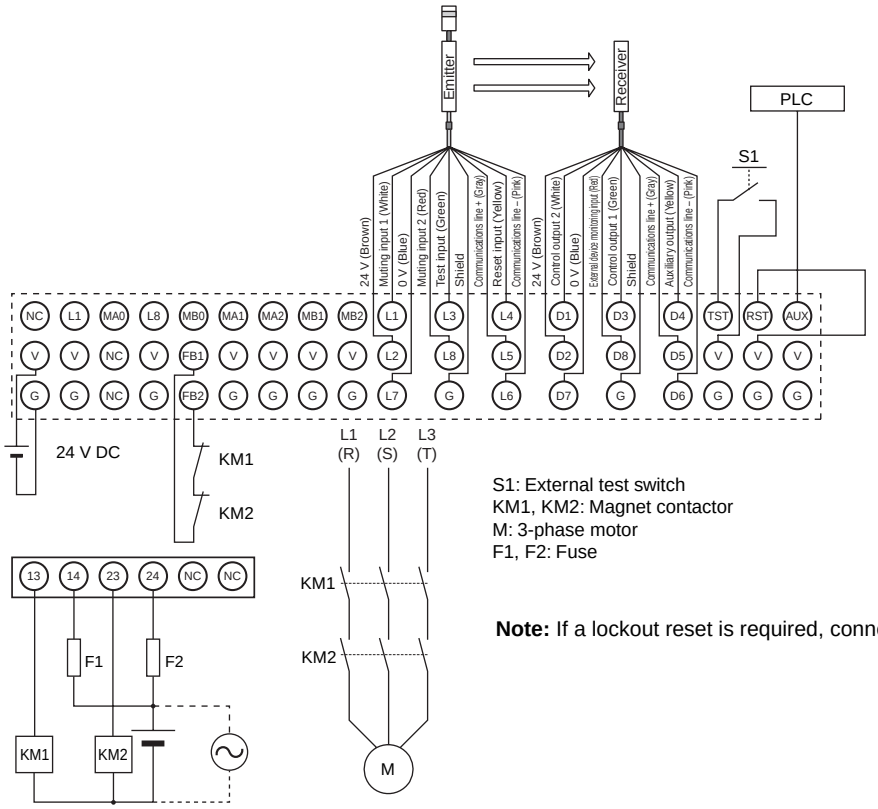
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**Note:** If you are connecting four muting sensors, connect the sensor outputs to MA1, MA2, MB1, and MB2. Also short-circuit MA0 to L1, and MB0 to L8.

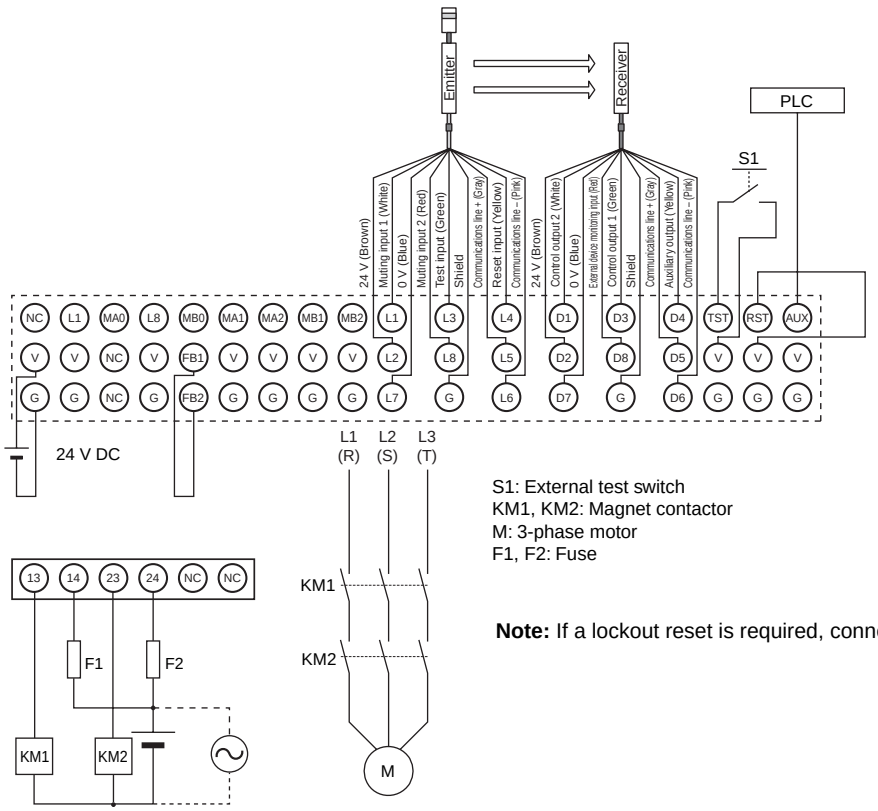
**The following example is for when no muting sensors are connected in the auto reset mode, and the external device monitoring function is enabled.**




S1: External test switch
KM1, KM2: Magnet contactor
M: 3-phase motor
F1, F2: Fuse

**Note:** If a lockout reset is required, connect a switch between RST and V.

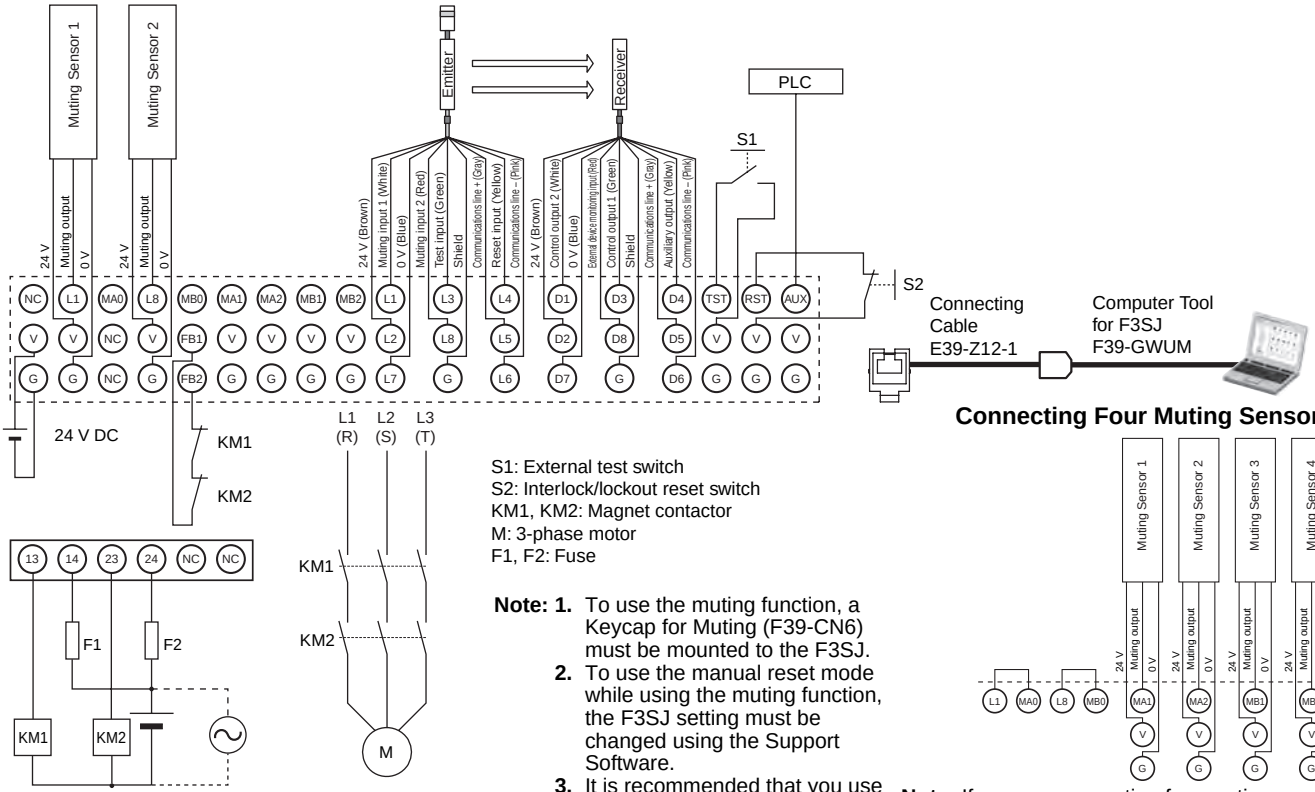
**The following example is for when no muting sensors are connected in the auto rest mode, and the external device monitoring function is disabled.**




S1: External test switch
KM1, KM2: Magnet contactor
M: 3-phase motor
F1, F2: Fuse

**Note:** If a lockout reset is required, connect a switch between RST and V.

**The following example is for when two muting sensors are connected in the manual reset mode, and the external device monitoring function is enabled.**




S1: External test switch
S2: Interlock/lockout reset switch
KM1, KM2: Magnet contactor
M: 3-phase motor
F1, F2: Fuse

**Note: 1.** To use the muting function, a Keycap for Muting (F39-CN6) must be mounted to the F3SJ.
**2.** To use the manual reset mode while using the muting function, the F3SJ setting must be changed using the Support Software.
**3.** It is recommended that you use the E39-Z12-1 as the modular cable to connect the Support Software.

Connecting Cable E39-Z12-1

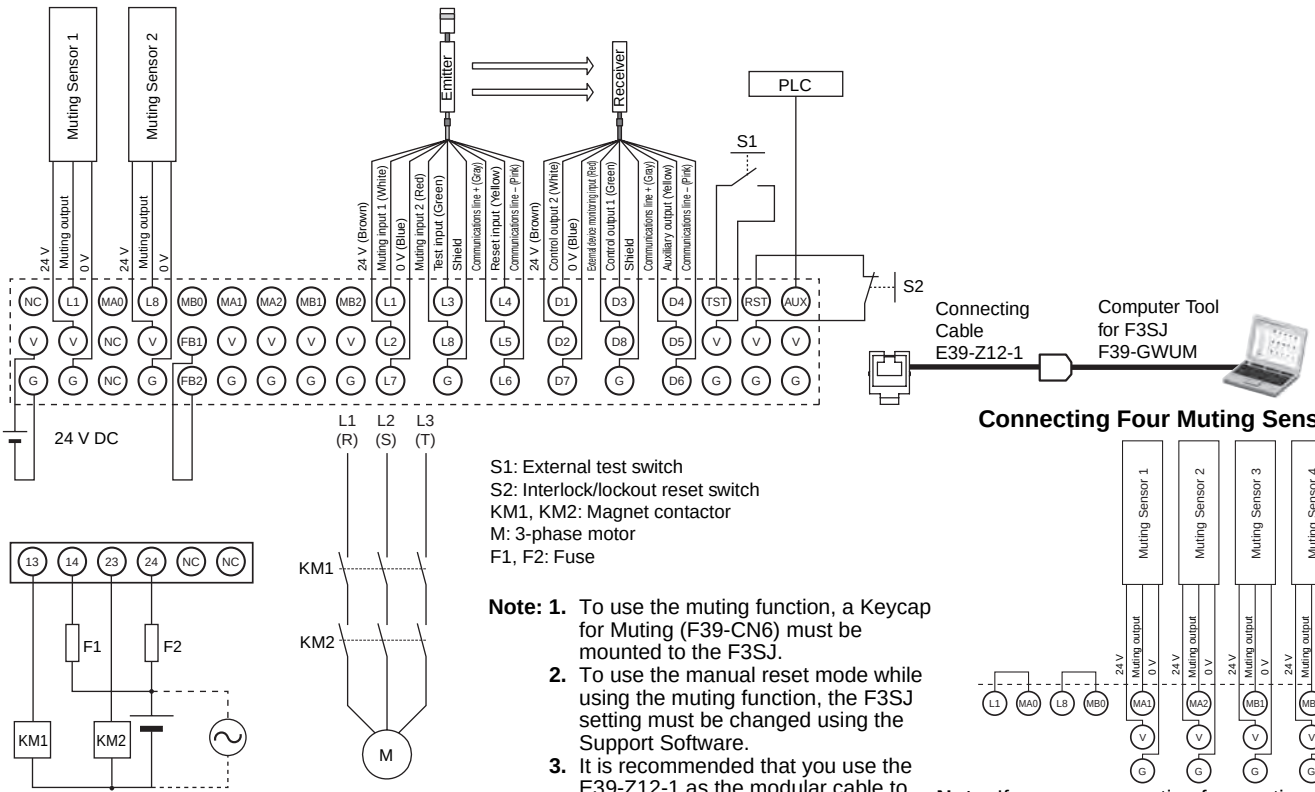
Computer Tool for F3SJ F39-GWUM

**Connecting Four Muting Sensors**




**Note:** If you are connecting four muting sensors, connect the sensor outputs to MA1, MA2, MB1, and MB2. Also short-circuit MA0 to L1, and MB0 to L8.

**The following example is for when two muting sensors are connected in manual reset mode, and the external device monitoring function is disabled.**




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Connecting Cable E39-Z12-1

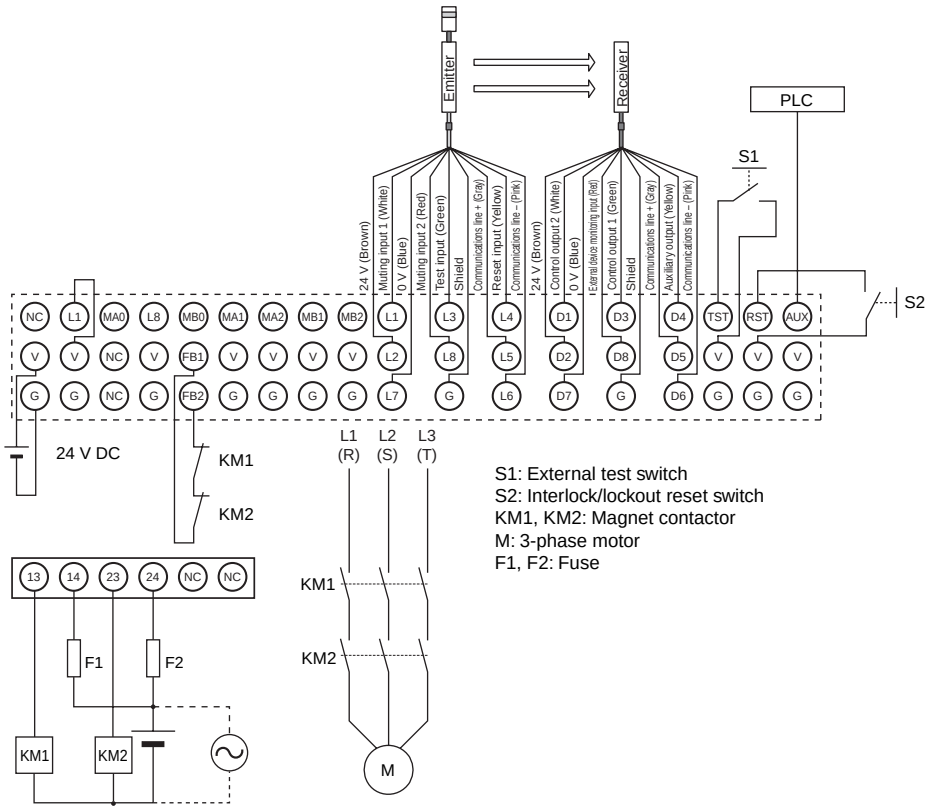
Computer Tool for F3SJ F39-GWUM

**Connecting Four Muting Sensors**

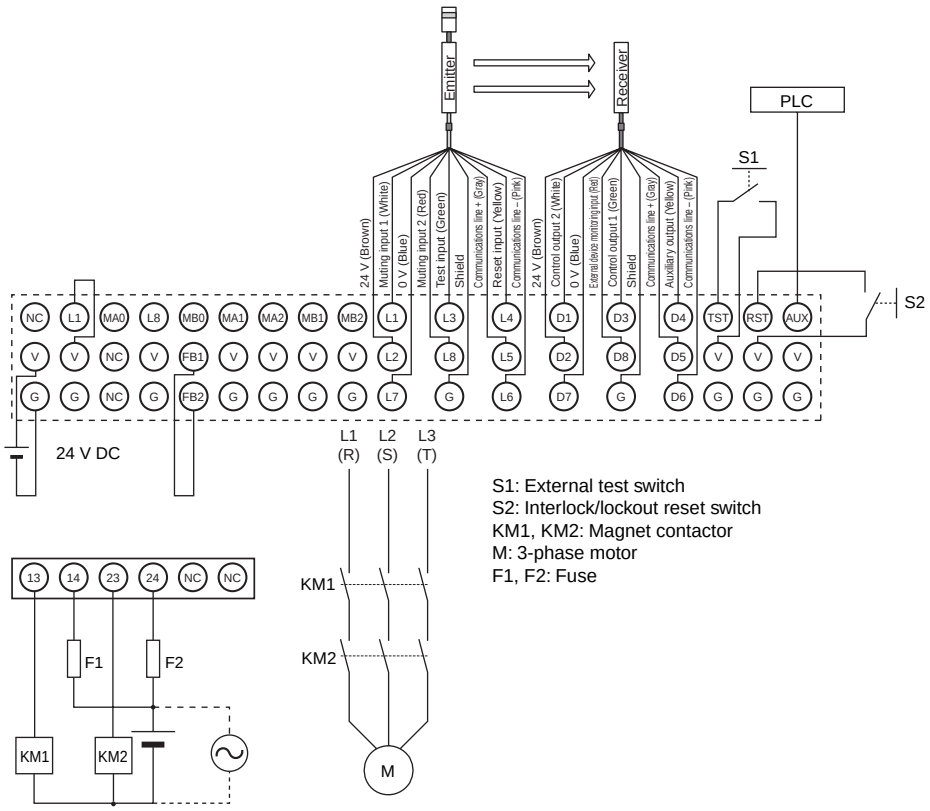



**Note:** If you are connecting four muting sensors, connect the sensor outputs to MA1, MA2, MB1, and MB2. Also short-circuit MA0 to L1, and MB0 to L8.

**The following example is for when no muting sensors are connected in the manual reset mode, and the external device monitoring function is enabled.**




**The following example is for when no muting sensors are connected in the manual rest mode, and the external device monitoring function is disabled.**

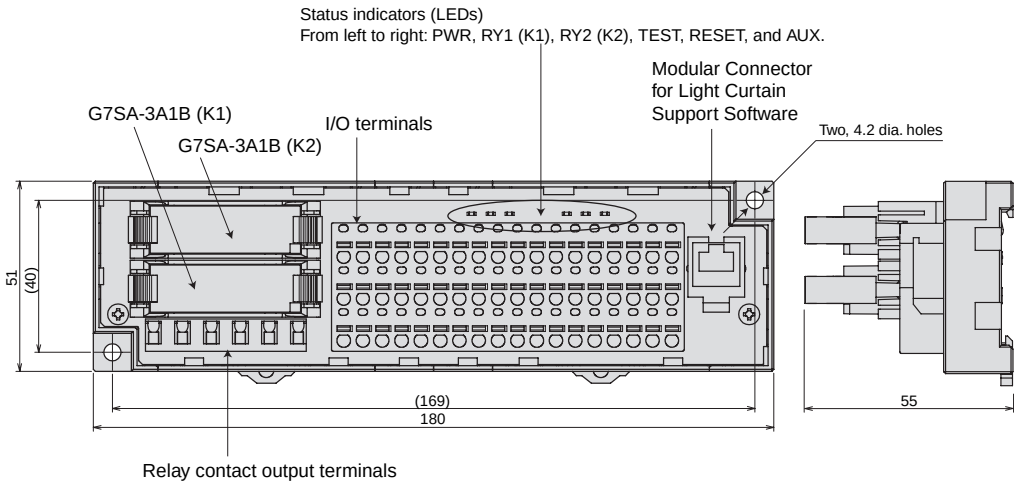


# F3SP-T01

## Dimensions

**(Unit: mm)**

### F3SP-T01



# Safety Precautions

**⚠ WARNING**

Do not operate the product in atmospheres containing flammable or explosive gas. Arcs or heating of relays during switching may cause fire or explosion.

Do not use a load that exceeds the contact ratings or switching capacity. Doing so may cause the product to fail to perform its specified functions, causing insulation failure, contact welding, or contact failure. It may also cause damage to the F3SP-T01 or burning.

The service life will depend on the switching conditions. Be sure to check the actual operating conditions using the actual devices, and make sure that the number of switching operations will not cause performance problems. If you continue to use the device with deteriorated performance, it may result in breakdown of insulation between circuits, or cause burning of the product.

## Precautions for Safe Use

### Handle with Care

Do not drop the product or expose it to excessive vibration or shock. Doing so may prevent it from functioning properly.

### Adhesion of Solvent

Do not allow solvents, such as alcohol, thinner, trichloroethane, or gasoline, to come into contact with the product. Such solvents may make the markings illegible and cause deterioration of parts.

### Installation Location

Do not install or store the product in the following locations. Doing so may result in product failure or malfunction.

- Locations subject to direct sunlight
- Locations subject to temperatures outside the range −10 to 55°C
- Locations subject to humidity levels outside the range 35% to 85%
- Locations subject to condensation due to extreme temperature changes
- Locations subject to atmospheric pressures outside the range 86 to 106 kPa
- Locations subject to corrosive or flammable gases
- Locations subject to shock or vibration in excess of the product ratings
- Locations subject to exposure to water, oil, or chemicals
- Locations subject to dust (including iron dust) or salts

Take appropriate and sufficient countermeasures when using the product in the following locations.

- Locations subject to static electricity or other forms of noise
- Locations subject to possible exposure to radioactivity
- Locations close to power supply lines

### Installation

- Do not use products that have been dropped or have its internal parts disassembled. Specified characteristics may not be achieved, and may cause damage to the product or burning.
- If the products are installed side-by-side, the rated current is 1 A. Do not exceed 1 A.
- Use the F3SP-T01 in an enclosure that provides at least IP54 degree of protection.

### Installation and Wiring

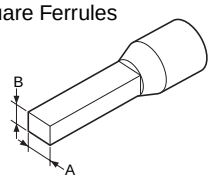
- Use the following electrical wiring for external I/O devices.

| | |
|---|---|
| **Solid wire** | 0.2 to 2.5 mm$^2$ AWG24 to 12 |
| **Flexible wires** | 0.34 to 1.5 mm$^2$, AWG22 to 16<br>If flexible wires are used, terminate the wires with insulated ferrules (DIN 46228-4 compatible type) before connecting them. |

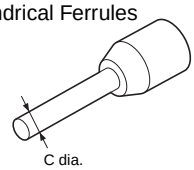
### Compatible Ferrules

- Use ferrules that meet the following standards for length and width. If the standards are not met, connection may fail, or the ferrules may not be able to be plugged in and out of the terminals.
- Ferrule Dimensions (for Power Supply Terminal of F3SP-T01)

Square Ferrules




Cylindrical Ferrules




| | | | |
|---|---|---|---|
| **Square Ferrules** | **Dimension A** | 1.0 to 2.3 | The cross-sectional area after crimping must be less than 4.8 mm$^2$. |
| | **Dimension B** | 0.8 to 2.65 | |
| **Cylindrical Ferrules** | **Dimension C** | 0.8 dia. to 2.3 dia. | |

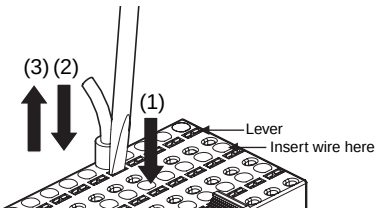
- Recommended Ferrule and Crimping Tool

| Type of ferrule | Manufacturer | Size | Model | Recommended crimping tool |
|---|---|---|---|---|
| Square Ferrules | Phoenix Contact | AWG24 | AI0.25-8YE | UD6<br>ZA3 |
| | | AWG22 | AI0.34-8TQ | |
| | | AWG20 | AI0.5-10WH<br>AI0.5-8WH | |
| | | AWG18 | AI0.75-10GY<br>AI0.75-8GY | |
| | | AWG16 | AI1.5-10BK | |
| | Weidmuller | AWG24 | H0.25/12 | PZ6 roto |
| | | AWG22 | H0.34/12 | |
| | | AWG20 | H0.5/16<br>H0.5/14 | |
| | | AWG18 | H0.75/16<br>H0.75/14 | |
| | | AWG16 | H1.5/16 | |
| Cylindrical Ferrules | Nichifu | AWG22 | TGV TC-1.25-11T<br>TGN TC-1.25-11T | NH11<br>NH32<br>NH65 |
| | | AWG20 | | |
| | | AWG18 | | |
| | | AWG16 | | |

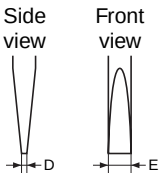
- Apply the specified voltages to the input terminals. Applying an inappropriate voltage may prevent specified functions from operating properly, which may cause damage to the product or burning.
- Disconnect the power supply before wiring.
- Check the condition of the emitter and receiver before connecting them.
- You cannot use the product if the positive side is connected to ground.
- NC terminals have no function. Do not connect them.

## Wiring the Terminal Block

- Insert the wires using the following procedure.
  Flexible wires: (1) Use a flat-blade screwdriver to push in the lever and (2) insert the wire.
  Solid wires or ferrules: Insert the wire into the wire hole and push all the way to the back. (Operating the lever is not required.)
- Remove the wires using the following procedure (same for flexible wires, solid wires, and ferrules).
  (1) Use a flat-blade screwdriver to push in the lever and (3) pull out the wire.




- Use a flat-blade screwdriver that has the same thickness from tip to base and is within the following standards.




| | |
|---|---|
| **Dimension D** | 0.3 to 0.8 |
| **Dimension E** | 2.9 to 3.6 |

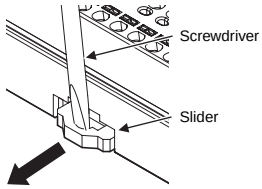
We recommend the following flat-blade screwdrivers for inserting wires.

### Recommended Screwdrivers

| Model |
|---|
| XW4Z-00B |
| XW4Z-00C |

## Mounting to and Removing from DIN Track

- To mount the product to a DIN Track, release the slider lock, place the product on the DIN track, and then lock the slider.
- After using the slider lock, make sure that the lock is engaged on the DIN Track.
- To dismount the product from the DIN Track, place the driver in the slider section, release the lock, and then remove the product from the DIN Track.
- Secure both ends of the Safety Terminal Relays with End Plates. The following products are sold separately.




| | |
|---|---|
| **DIN Tracks** | PFP-50N<br>PFP-100N |
| **End Plate** | PFP-M |

## Selecting the Power Supply

- Use the rated power supply voltage. Do not use power supplies with large ripple component or intermittent irregular voltages.
- To meet IEC 61496-1 and UL 508 safety standards and to prevent electrical shock, make sure that the power supply and load satisfy the requirements outlined in the sensor's user manual.

## Periodic Checks and Maintenance

- Do not attempt to disassemble, repair, or modify the product.
- Make sure that the power supply is turned OFF before replacing parts.

## Disposal

- Exercise caution to prevent injury when disassembling the F3SP-T01.

## Precautions for Correct Use

### Durability of Contact Outputs

The durability of the contact outputs on Safety Terminal Relays varies considerably depending on switching conditions. Always confirm the usage conditions by testing the Safety Terminal Relay in an actual application, and use the Safety Terminal Relay only for the number of switching operations that its performance allows. Restarting may not be possible if the switching capacity is exceeded. If this occurs, replace the relevant relays immediately. If a Safety Terminal Relay is used after performance has deteriorated, it may result in reduced safety.

MEMO

# F3SN-A/F3SN-B/F3SH-A

- Lineup includes Type-4 Sensors (F3SN-A/F3SH-A) and Type-2 Sensors (F3SN-B) with IEC, EN, and JIS standard certification.
  EC Machine Directive compliance (from DEMKO).
  USA UL compliance for applications for the USA or Canada.
- Protective height equals the Sensor length to perfectly meet user needs.
- Protective height: 189 to 1,822 mm
  Operating range: 7 or 10 m
- Setting Console enabling setting parameters for any model.
- LED bar for beam alignment or easy confirmation in error mode.
- A complete lineup of accessories.



⚠ Be sure to read the *"Safety Precautions"* on page 405 and the *"Precautions for All Safety Sensors"* on page 242.



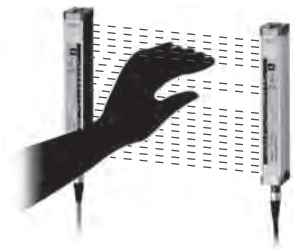
## Features

### Two Forms of Safety from OMRON: Safety Light Curtains and Multibeam Safety Sensors

#### Safety Light Curtains for Finger Protection

**F3SN-A□□□□P14**

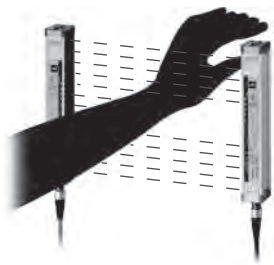
- Operating range: 7 m
- Smallest detectable object: 14 mm dia. (beam gap: 9 mm)
- Protective height: 189 to 1,125 mm



#### Safety Light Curtains for Hand Protection

**F3SN-A□□□□P25**
**F3SN-B□□□□P25**

- Operating range: 10 m
- Smallest detectable object: 25 mm dia. (beam gap:15 mm)
- Protective height: 217 to 1,822 mm



#### Presence Detection in Danger Zones (Horizontal Installation)

**F3SN-A□□□□P40/P70**
**F3SN-B□□□□P40/P70**

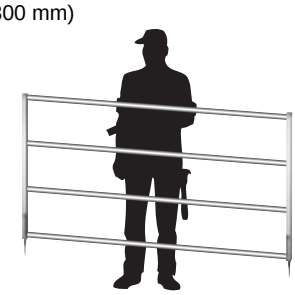
- Operating range: 10 m
- Smallest detectable object: 40 mm dia. (beam gap: 30 mm) or 70 mm dia. (beam gap: 60 mm)
- Protective height:
  F3SN-A: 217 to 1,822 mm
  F3SN-B: 217 to 1,777 mm



#### Multi-beam Safety Sensor for Body Protection

**F3SN-A09P03**

- Operating range: 10 m
- Number of beams: 4 (beam gap: 300 mm)



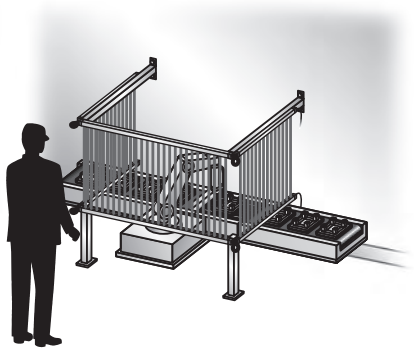
# A New Concept to Meet User Needs

## Connect Up To Three Sets in Series without Mutual Interference

Combine Standard Models with Linking Models with Connectors to connect up to three sets in series. Wiring is required only for one set instead of wiring all three sets, as would have been required previously, to enable protecting all sides of hazardous areas. Mutual interference protection is also provided.

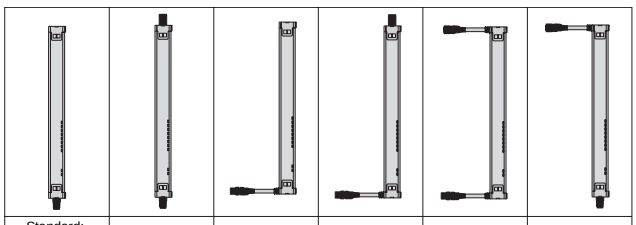


**Note:** Use models with the following model number suffixes for series connection: -01, -03, -04, and -05



## Many Connector Variations

Select the type of connector that best suits the machine. (Consult your OMRON representative.)



| Standard: No model No. suffix | Model No. suffix: -01 | Model No. suffix: -02 | Model No. suffix: -03 | Model No. suffix: -04 | Model No. suffix: -05 |
|---|---|---|---|---|---|

## Various Safety Functions Built into the Sensor. Supports Many Safety Circuit Configurations

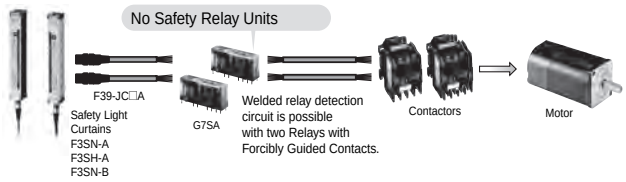
- Interlocks
- Auto-reset or manual reset
- External relay monitoring

## Select the Safety Circuits for the Required Safety Standards

### Build Circuits for Type 4 (F3SN-A/F3SH-A) or Type 2 (F3SN-B) with No Relay Units (2 Relays with Forcibly Guided Contacts)

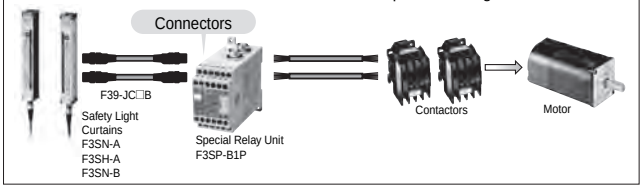
- Reduced Costs and Reduced Space Requirements

A built-in external relay monitor function eliminates the need for Safety Relay Units.




- Reduced Wiring and Easy Maintenance

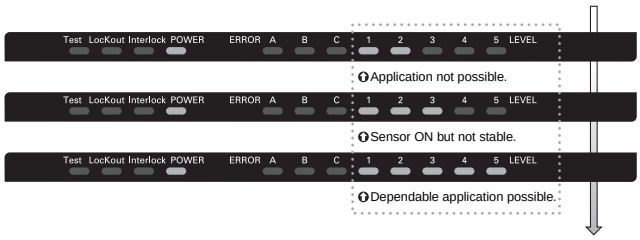
One-touch connection with connectors on both end to prevent wiring mistakes.




## LED Bars for Easier Application

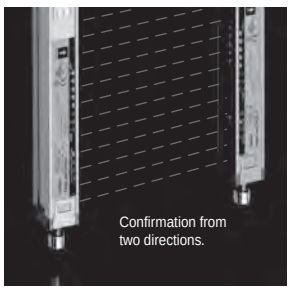
### Align Beams with the LED Bar for Easier Installation

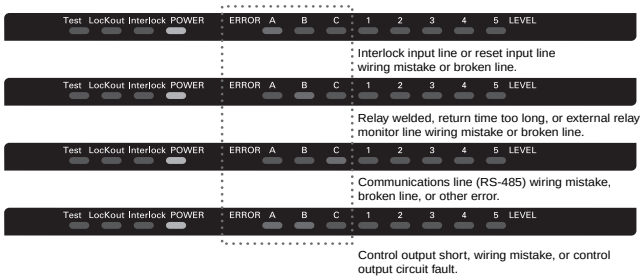
- Beam Alignment Indicators (Green Only)




## Easily Discern Error Mode Displays to Back Up Safety

- Error Indication Example (Red Only)



# Ordering Information

## Main Units (Connecting Cables are not included with the Main Units. The connecting cables must be purchased separately.)

### F3SN-A Safety Light Curtains (Type 4)

Infrared

| Detection capability | Beam gap | Appearance | Operating range | Number of beams | Protective height | Connector for series-connection | Model ✻1 ✻2 |
|---|---|---|---|---|---|---|---|
| 14 mm-dia. (for finger protection) | 9 mm |  | 0.2 to 7 m | 21 to 125 (odd numbers only) | 189 to 1125 mm (every 18 mm) | No | **F3SN-A□□□□P14** |
| | | | | | | Yes | **F3SN-A□□□□P14-01** |
| 25 mm-dia. (for hand protection) | 15 mm | | | 13 to 120 | 217 to 1822 mm (every 15 mm) | No | **F3SN-A□□□□P25** |
| | | | | | | Yes | **F3SN-A□□□□P25-01** |
| 40 mm-dia. (for presence protection) | 30 mm | | 0.2 to 10 m | 7 to 60 | 217 to 1807 mm | No | **F3SN-A□□□□P40** |
| | | | | | | Yes | **F3SN-A□□□□P40-01** |
| 70 mm-dia. (for presence detection) | 60 mm | | | 5 to 30 | 277 to 1777 mm | No | **F3SN-A□□□□P70** |
| | | | | | | Yes | **F3SN-A□□□□P70-01** |

✻1. The □□□□ in the model numbers indicates the protective height (in mm). Refer to *"Safety Light Curtain Model List"* on page 381 for model number details.

✻2. Safety Light Curtains with model numbers ending in -02 through -05, provided with different connector configurations, are also available as options. Refer to page 379 for details. Consult with your dealer or OMRON representative when ordering these models.

### F3SN-B Safety Light Curtains (Type 2)

Infrared

| Detection capability | Beam gap | Appearance | Operating range | Number of beams | Protective height | Output ✻1 | Connector for series-connection | Model ✻2 ✻3 |
|---|---|---|---|---|---|---|---|---|
| 25 mm-dia. (for hand protection) | 15 mm |  | 0.2 to 10 m | 13 to 119 (non-continuous) | 217 to 1807 mm | PNP transistor output | No | **F3SN-B□□□□P25** |
| | | | | | | | Yes | **F3SN-B□□□□P25-01** |
| 40 mm-dia. (for presence detection) | 30 mm | | | 7 to 60 (non-continuous) | 217 to 1807 mm | | No | **F3SN-B□□□□P40** |
| | | | | | | | Yes | **F3SN-B□□□□P40-01** |
| 70 mm-dia. (for presence detection) | 60 mm | | | 5 to 30 | 277 to 1777 mm | | No | **F3SN-B□□□□P70** |
| | | | | | | | Yes | **F3SN-B□□□□P70-01** |

✻1. Models with NPN transistor outputs are also available as options. For details on the method for securing safety by using an NPN transistor for output, contact your OMRON representative.

✻2. The □□□□ in the model numbers indicates the protective height (in mm). Refer to *"Safety Light Curtain Model List"* on page 381 for model number details.

✻3. Safety Light Curtains with model numbers ending in -02 through -05, provided with different connector configurations, are also available as options. Refer to page 379 for details. Consult with your dealer or OMRON representative when ordering these models.

### F3SH-A Multi-beam Safety Sensors (Type 4)

Infrared

| Beam gap | Appearance | Operating range | Number of beams | Outermost beam gap | Connector for series-connection | Model ✻ |
|---|---|---|---|---|---|---|
| 300 mm (for whole body protection) |  | 0.2 to 10 m | 4 | 900 mm | No | **F3SH-A09P03** |
| | | | | | Yes | **F3SH-A09P03-01** |

✻ Safety Light Curtains of model numbers ending in -02 through -05, provided with different connector configurations, are also available as options. Refer to page 379 for details. Consult with your dealer or OMRON representative when ordering this model.

## Safety Light Curtain Model List

: F3SN-B□□□□P□□ safety light curtains are also available.

### F3SN-A□□□□P14(-01)

| Model | Protective height | Number of beams |
|---|---|---|
| F3SN-A0189P14(-01) | 189 | 21 |
| F3SN-A0207P14(-01) | 207 | 23 |
| F3SN-A0225P14(-01) | 225 | 25 |
| F3SN-A0243P14(-01) | 243 | 27 |
| F3SN-A0261P14(-01) | 261 | 29 |
| F3SN-A0279P14(-01) | 279 | 31 |
| F3SN-A0297P14(-01) | 297 | 33 |
| F3SN-A0315P14(-01) | 315 | 35 |
| F3SN-A0333P14(-01) | 333 | 37 |
| F3SN-A0351P14(-01) | 351 | 39 |
| F3SN-A0369P14(-01) | 369 | 41 |
| F3SN-A0387P14(-01) | 387 | 43 |
| F3SN-A0405P14(-01) | 405 | 45 |
| F3SN-A0423P14(-01) | 423 | 47 |
| F3SN-A0441P14(-01) | 441 | 49 |
| F3SN-A0459P14(-01) | 459 | 51 |
| F3SN-A0477P14(-01) | 477 | 53 |
| F3SN-A0495P14(-01) | 495 | 55 |
| F3SN-A0513P14(-01) | 513 | 57 |
| F3SN-A0531P14(-01) | 531 | 59 |
| F3SN-A0549P14(-01) | 549 | 61 |
| F3SN-A0567P14(-01) | 567 | 63 |
| F3SN-A0585P14(-01) | 585 | 65 |
| F3SN-A0603P14(-01) | 603 | 67 |
| F3SN-A0621P14(-01) | 621 | 69 |
| F3SN-A0639P14(-01) | 639 | 71 |
| F3SN-A0657P14(-01) | 657 | 73 |
| F3SN-A0675P14(-01) | 675 | 75 |
| F3SN-A0693P14(-01) | 693 | 77 |
| F3SN-A0711P14(-01) | 711 | 79 |
| F3SN-A0729P14(-01) | 729 | 81 |
| F3SN-A0747P14(-01) | 747 | 83 |
| F3SN-A0765P14(-01) | 765 | 85 |
| F3SN-A0783P14(-01) | 783 | 87 |
| F3SN-A0801P14(-01) | 801 | 89 |
| F3SN-A0819P14(-01) | 819 | 91 |
| F3SN-A0837P14(-01) | 837 | 93 |
| F3SN-A0855P14(-01) | 855 | 95 |
| F3SN-A0873P14(-01) | 873 | 97 |
| F3SN-A0891P14(-01) | 891 | 99 |
| F3SN-A0909P14(-01) | 909 | 101 |
| F3SN-A0927P14(-01) | 927 | 103 |
| F3SN-A0945P14(-01) | 945 | 105 |
| F3SN-A0963P14(-01) | 963 | 107 |
| F3SN-A0981P14(-01) | 981 | 109 |
| F3SN-A0999P14(-01) | 999 | 111 |
| F3SN-A1017P14(-01) | 1017 | 113 |
| F3SN-A1035P14(-01) | 1035 | 115 |
| F3SN-A1053P14(-01) | 1053 | 117 |
| F3SN-A1071P14(-01) | 1071 | 119 |
| F3SN-A1089P14(-01) | 1089 | 121 |
| F3SN-A1107P14(-01) | 1107 | 123 |
| F3SN-A1125P14(-01) | 1125 | 125 |

### F3SN-A□□□□P25(-01), F3SN-B□□□□P25(-01)

| Model | Protective height | Number of beams |
|---|---|---|
| F3SN-A0217P25(-01) | 217 | 13 |
| F3SN-A0232P25(-01) | 232 | 14 |
| F3SN-A0247P25(-01) | 247 | 15 |
| F3SN-A0262P25(-01) | 262 | 16 |
| F3SN-A0277P25(-01) | 277 | 17 |
| F3SN-A0292P25(-01) | 292 | 18 |
| F3SN-A0307P25(-01) | 307 | 19 |
| F3SN-A0322P25(-01) | 322 | 20 |
| F3SN-A0337P25(-01) | 337 | 21 |
| F3SN-A0352P25(-01) | 352 | 22 |
| F3SN-A0367P25(-01) | 367 | 23 |
| F3SN-A0382P25(-01) | 382 | 24 |
| F3SN-A0397P25(-01) | 397 | 25 |
| F3SN-A0412P25(-01) | 412 | 26 |
| F3SN-A0427P25(-01) | 427 | 27 |
| F3SN-A0442P25(-01) | 442 | 28 |
| F3SN-A0457P25(-01) | 457 | 29 |
| F3SN-A0472P25(-01) | 472 | 30 |
| F3SN-A0487P25(-01) | 487 | 31 |
| F3SN-A0502P25(-01) | 502 | 32 |
| F3SN-A0517P25(-01) | 517 | 33 |
| F3SN-A0532P25(-01) | 532 | 34 |
| F3SN-A0547P25(-01) | 547 | 35 |
| F3SN-A0562P25(-01) | 562 | 36 |
| F3SN-A0577P25(-01) | 577 | 37 |
| F3SN-A0592P25(-01) | 592 | 38 |
| F3SN-A0607P25(-01) | 607 | 39 |
| F3SN-A0622P25(-01) | 622 | 40 |
| F3SN-A0637P25(-01) | 637 | 41 |
| F3SN-A0652P25(-01) | 652 | 42 |
| F3SN-A0667P25(-01) | 667 | 43 |
| F3SN-A0682P25(-01) | 682 | 44 |
| F3SN-A0697P25(-01) | 697 | 45 |
| F3SN-A0712P25(-01) | 712 | 46 |
| F3SN-A0727P25(-01) | 727 | 47 |
| F3SN-A0742P25(-01) | 742 | 48 |
| F3SN-A0757P25(-01) | 757 | 49 |
| F3SN-A0772P25(-01) | 772 | 50 |
| F3SN-A0787P25(-01) | 787 | 51 |
| F3SN-A0802P25(-01) | 802 | 52 |
| F3SN-A0817P25(-01) | 817 | 53 |
| F3SN-A0832P25(-01) | 832 | 54 |
| F3SN-A0847P25(-01) | 847 | 55 |
| F3SN-A0862P25(-01) | 862 | 56 |
| F3SN-A0877P25(-01) | 877 | 57 |
| F3SN-A0892P25(-01) | 892 | 58 |
| F3SN-A0907P25(-01) | 907 | 59 |
| F3SN-A0922P25(-01) | 922 | 60 |
| F3SN-A0937P25(-01) | 937 | 61 |
| F3SN-A0952P25(-01) | 952 | 62 |
| F3SN-A0967P25(-01) | 967 | 63 |
| F3SN-A0982P25(-01) | 982 | 64 |
| F3SN-A0997P25(-01) | 997 | 65 |
| F3SN-A1012P25(-01) | 1012 | 66 |
| F3SN-A1027P25(-01) | 1027 | 67 |
| F3SN-A1042P25(-01) | 1042 | 68 |
| F3SN-A1057P25(-01) | 1057 | 69 |
| F3SN-A1072P25(-01) | 1072 | 70 |
| F3SN-A1087P25(-01) | 1087 | 71 |
| F3SN-A1102P25(-01) | 1102 | 72 |
| F3SN-A1117P25(-01) | 1117 | 73 |
| F3SN-A1132P25(-01) | 1132 | 74 |
| F3SN-A1147P25(-01) | 1147 | 75 |
| F3SN-A1162P25(-01) | 1162 | 76 |
| F3SN-A1177P25(-01) | 1177 | 77 |
| F3SN-A1192P25(-01) | 1192 | 78 |
| F3SN-A1207P25(-01) | 1207 | 79 |
| F3SN-A1222P25(-01) | 1222 | 80 |
| F3SN-A1237P25(-01) | 1237 | 81 |
| F3SN-A1252P25(-01) | 1252 | 82 |
| F3SN-A1267P25(-01) | 1267 | 83 |
| F3SN-A1282P25(-01) | 1282 | 84 |
| F3SN-A1297P25(-01) | 1297 | 85 |
| F3SN-A1312P25(-01) | 1312 | 86 |
| F3SN-A1327P25(-01) | 1327 | 87 |
| F3SN-A1342P25(-01) | 1342 | 88 |
| F3SN-A1357P25(-01) | 1357 | 89 |
| F3SN-A1372P25(-01) | 1372 | 90 |
| F3SN-A1387P25(-01) | 1387 | 91 |
| F3SN-A1402P25(-01) | 1402 | 92 |
| F3SN-A1417P25(-01) | 1417 | 93 |
| F3SN-A1432P25(-01) | 1432 | 94 |
| F3SN-A1447P25(-01) | 1447 | 95 |
| F3SN-A1462P25(-01) | 1462 | 96 |
| F3SN-A1477P25(-01) | 1477 | 97 |
| F3SN-A1492P25(-01) | 1492 | 98 |
| F3SN-A1507P25(-01) | 1507 | 99 |
| F3SN-A1522P25(-01) | 1522 | 100 |
| F3SN-A1537P25(-01) | 1537 | 101 |
| F3SN-A1552P25(-01) | 1552 | 102 |
| F3SN-A1567P25(-01) | 1567 | 103 |
| F3SN-A1582P25(-01) | 1582 | 104 |
| F3SN-A1597P25(-01) | 1597 | 105 |
| F3SN-A1612P25(-01) | 1612 | 106 |
| F3SN-A1627P25(-01) | 1627 | 107 |
| F3SN-A1642P25(-01) | 1642 | 108 |
| F3SN-A1657P25(-01) | 1657 | 109 |
| F3SN-A1672P25(-01) | 1672 | 110 |
| F3SN-A1687P25(-01) | 1687 | 111 |
| F3SN-A1702P25(-01) | 1702 | 112 |
| F3SN-A1717P25(-01) | 1717 | 113 |
| F3SN-A1732P25(-01) | 1732 | 114 |
| F3SN-A1747P25(-01) | 1747 | 115 |
| F3SN-A1762P25(-01) | 1762 | 116 |
| F3SN-A1777P25(-01) | 1777 | 117 |
| F3SN-A1792P25(-01) | 1792 | 118 |
| F3SN-A1807P25(-01) | 1807 | 119 |
| F3SN-A1822P25(-01) | 1822 | 120 |

**F3SN-A□□□□P40(-01), F3SN-B□□□□P40(-01)**

| Model | Protective height | Number of beams |
|---|---|---|
| F3SN-A0217P40(-01) | 217 | 7 |
| F3SN-A0247P40(-01) | 247 | 8 |
| F3SN-A0277P40(-01) | 277 | 9 |
| F3SN-A0307P40(-01) | 307 | 10 |
| F3SN-A0337P40(-01) | 337 | 11 |
| F3SN-A0367P40(-01) | 367 | 12 |
| F3SN-A0397P40(-01) | 397 | 13 |
| F3SN-A0427P40(-01) | 427 | 14 |
| F3SN-A0457P40(-01) | 457 | 15 |
| F3SN-A0487P40(-01) | 487 | 16 |
| F3SN-A0517P40(-01) | 517 | 17 |
| F3SN-A0547P40(-01) | 547 | 18 |
| F3SN-A0577P40(-01) | 577 | 19 |
| F3SN-A0607P40(-01) | 607 | 20 |
| F3SN-A0637P40(-01) | 637 | 21 |
| F3SN-A0667P40(-01) | 667 | 22 |
| F3SN-A0697P40(-01) | 697 | 23 |
| F3SN-A0727P40(-01) | 727 | 24 |
| F3SN-A0757P40(-01) | 757 | 25 |
| F3SN-A0787P40(-01) | 787 | 26 |
| F3SN-A0817P40(-01) | 817 | 27 |
| F3SN-A0847P40(-01) | 847 | 28 |
| F3SN-A0877P40(-01) | 877 | 29 |
| F3SN-A0907P40(-01) | 907 | 30 |
| F3SN-A0937P40(-01) | 937 | 31 |
| F3SN-A0967P40(-01) | 967 | 32 |
| F3SN-A0997P40(-01) | 997 | 33 |

| Model | Protective height | Number of beams |
|---|---|---|
| F3SN-A1027P40(-01) | 1027 | 34 |
| F3SN-A1057P40(-01) | 1057 | 35 |
| F3SN-A1087P40(-01) | 1087 | 36 |
| F3SN-A1117P40(-01) | 1117 | 37 |
| F3SN-A1147P40(-01) | 1147 | 38 |
| F3SN-A1177P40(-01) | 1177 | 39 |
| F3SN-A1207P40(-01) | 1207 | 40 |
| F3SN-A1237P40(-01) | 1237 | 41 |
| F3SN-A1267P40(-01) | 1267 | 42 |
| F3SN-A1297P40(-01) | 1297 | 43 |
| F3SN-A1327P40(-01) | 1327 | 44 |
| F3SN-A1357P40(-01) | 1357 | 45 |
| F3SN-A1387P40(-01) | 1387 | 46 |
| F3SN-A1417P40(-01) | 1417 | 47 |
| F3SN-A1447P40(-01) | 1447 | 48 |
| F3SN-A1477P40(-01) | 1477 | 49 |
| F3SN-A1507P40(-01) | 1507 | 50 |
| F3SN-A1537P40(-01) | 1537 | 51 |
| F3SN-A1567P40(-01) | 1567 | 52 |
| F3SN-A1597P40(-01) | 1597 | 53 |
| F3SN-A1627P40(-01) | 1627 | 54 |
| F3SN-A1657P40(-01) | 1657 | 55 |
| F3SN-A1687P40(-01) | 1687 | 56 |
| F3SN-A1717P40(-01) | 1717 | 57 |
| F3SN-A1747P40(-01) | 1747 | 58 |
| F3SN-A1777P40(-01) | 1777 | 59 |
| F3SN-A1807P40(-01) | 1807 | 60 |

**F3SN-A□□□□P70(-01), F3SN-B□□□□P70(-01)**

| Model | Protective height | Number of beams |
|---|---|---|
| F3SN-A0277P70(-01) | 277 | 5 |
| F3SN-A0337P70(-01) | 337 | 6 |
| F3SN-A0397P70(-01) | 397 | 7 |
| F3SN-A0457P70(-01) | 457 | 8 |
| F3SN-A0517P70(-01) | 517 | 9 |
| F3SN-A0577P70(-01) | 577 | 10 |
| F3SN-A0637P70(-01) | 637 | 11 |
| F3SN-A0697P70(-01) | 697 | 12 |
| F3SN-A0757P70(-01) | 757 | 13 |
| F3SN-A0817P70(-01) | 817 | 14 |
| F3SN-A0877P70(-01) | 877 | 15 |
| F3SN-A0937P70(-01) | 937 | 16 |
| F3SN-A0997P70(-01) | 997 | 17 |
| F3SN-A1057P70(-01) | 1057 | 18 |
| F3SN-A1117P70(-01) | 1117 | 19 |
| F3SN-A1177P70(-01) | 1177 | 20 |
| F3SN-A1237P70(-01) | 1237 | 21 |
| F3SN-A1297P70(-01) | 1297 | 22 |
| F3SN-A1357P70(-01) | 1357 | 23 |
| F3SN-A1417P70(-01) | 1417 | 24 |
| F3SN-A1477P70(-01) | 1477 | 25 |
| F3SN-A1537P70(-01) | 1537 | 26 |
| F3SN-A1597P70(-01) | 1597 | 27 |
| F3SN-A1657P70(-01) | 1657 | 28 |
| F3SN-A1717P70(-01) | 1717 | 29 |
| F3SN-A1777P70(-01) | 1777 | 30 |

## Accessories (Optional)

### Control Unit

| Appearance | Output | Model | Remarks |
|---|---|---|---|
|  | Relay, 3NO + 1NC | **F3SP-B1P** | For connection with the F3SN-A, F3SN-B, and F3SH-A, use F39-JC□B cables fitted with connectors at both ends. |

OMRON offers many Safety Application Controllers to help you build safety circuits.
Refer to *"Safety Application Controller Product Selection"* on page 568 and specifications on page 574.

## Setting Console

| Appearance | Model | Accessories |
|---|---|---|
|  | **F39-MC11** | Branching Connector (1),<br>Connector Cap (1),<br>Special Cable (2 m),<br>Instruction Manual |

## Maintenance Tool ✻

| Appearance | Model | Applicable Sensors | Accessories |
|---|---|---|---|
|  | **F39-MT11** | F3SN-A series<br>F3SN-B series<br>F3SH-A series | Branching Connector (1),<br>Connector Cap (1),<br>Special Cable (2 m),<br>Special Cable with Plug (0.3 m),<br>Instruction Manual |

✻ For detail, see the product datasheet (Cat. No. E355).

## Branching Connector

| Appearance | Model | Remarks |
|---|---|---|
|  | **F39-CN1** | Purchase this connector when needed additionally for installing the F39-MC11. |

## Cable with Connector on One End (for Emitter and Receiver Set)

| Appearance | Cable length | Specification | Model |
|---|---|---|---|
|  | 0.5 m | M12 connector (8 pin) | **F39-JCR5A** |
| | 3 m | | **F39-JC3A** |
| | 7 m | | **F39-JC7A** |
| | 10 m | | **F39-JC10A** |
| | 15 m | | **F39-JC15A** |

## Cables with Connectors on Both Ends (for Emitter and Receiver Set)

| Appearance | Cable length | Specification | Model | Application |
|---|---|---|---|---|
|  | 0.2 m | M12 connector (8 pins) | **F39-JCR2B** | Series connection or connection with F3SP-B1P |
| | 0.5 m | | **F39-JCR5B** | |
| | 1 m | | **F39-JC1B** | |
| | 3 m | | **F39-JC3B** | |
| | 5 m | | **F39-JC5B** | Connection with F3SP-B1P ✻1 |
| | 7 m | | **F39-JC7B** | |
| | 10 m | | **F39-JC10B** | |
| | 15 m | | **F39-JC15B** | |
| | 20 m | | **F39-JC20B** | |
| | 30 m | | **F39-JC30B** | |
| | 40 m | | **F39-JC40B** | |
| | 0.2 m | M12 connector (8 pins) | **F39-JCR2C** | Connection with G9SA-300-SC ✻1 ✻2 |
| | 1 m | | **F39-JC1C** | |
| | 3 m | | **F39-JC3C** | |
| | 7 m | | **F39-JC7C** | |
| | 10 m | | **F39-JC10C** | |
| | 15 m | | **F39-JC15C** | |

**✻1.** Cannot be used for series-connection purpose.

**✻2.** When two or more cables have to be used for connection with the G9SA-300-SC, connect the necessary number of F39-JC□B cables to one F39-JC□C cable.
(Example) When a 35 m long cable is required, connect two F39-JC10B cables to one F39-JC15C.

## External Indicators (Separate Models for Emitters and Receivers)

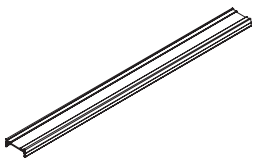
| Appearance | Specification | Indicator | Type | Model |
|---|---|---|---|---|
|  | M12 connector for PNP output | Red | Emitter | **F39-A01PR-L** |
| | | | Receiver | **F39-A01PR-D** |
| | | Green | Emitter | **F39-A01PG-L** |
| | | | Receiver | **F39-A01PG-D** |

**Note:** These indicators are used for connecting with series-connection type emitters/receivers (models ending in -01). (The Indicator must be secured separately for models ending in -04 or -05.) The desired turn-ON timing (type of signal) can be selected on setting console.

## Mirrors (Reduce Operating Range by 12% with Each Unit)

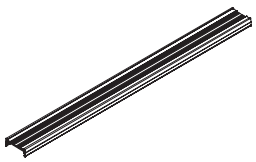
| Mirror material | Width (mm) | Depth (mm) | Length (mm) | Model |
|---|---|---|---|---|
| Glass mirror | 145 | 32 | 406 | **F39-MLG0406** |
| | | | 610 | **F39-MLG0610** |
| | | | 711 | **F39-MLG0711** |
| | | | 914 | **F39-MLG0914** |
| | | | 1,067 | **F39-MLG1067** |
| | | | 1,219 | **F39-MLG1219** |
| | | | 1,422 | **F39-MLG1422** |
| | | | 1,626 | **F39-MLG1626** |
| | | | 1,830 | **F39-MLG1830** |
| | | | 2,134 | **F39-MLG2134** |

## Spatter Protection Covers (Include Two Pieces for Emitter and Receiver) (Reduces Operating Range by 10% with Each Unit)

| Appearance | Applicable sensor | Model |
|---|---|---|
|  | F3SN-A□□□□P14 | **F39-HN□□□□-14** |
| | F3SN-A□□□□P25(-01)<br>F3SN-A□□□□P40(-01)<br>F3SN-A□□□□P70(-01)<br>F3SN-B□□□□P25<br>F3SN-B□□□□P40<br>F3SN-B□□□□P70 | **F39-HN□□□□-25** |
| | F3SH-A09P03(-01) | **F39-HH09-03** |

**Note:** The same 4-digit numbers as the protective heights (□□□□ in the light curtain type names) are substituted by □□□□ in the model names.

## Spatter Protection Slit Covers (Include Two Pieces for Emitter and Receiver) ✻

| Appearance | Applicable sensor | Model | |
|---|---|---|---|
| | | Slit width: 1.15 mm | Slit width: 0.6 mm |
|  | F3SN-A□□□□P14(-01) | **F39-HS□□□□A-14** | **F39-HS□□□□B-14** |
| | F3SN-A□□□□P25(-01)<br>F3SN-A□□□□P40(-01)<br>F3SN-A□□□□P70(-01)<br>F3SN-B□□□□P25<br>F3SN-B□□□□P40<br>F3SN-B□□□□P70 | **F39-HS□□□□A-25** | **F39-HS□□□□B-25** |
| | F3SH-A09P03(-01) | **F39-HSH09A-03** | **F39-HSH09B-03** |

✻ Operating range will decrease substantially. Refer to *"Specifications*" on page 389 for details.

## Environment-resistant Enclosures (Package of a Pipe, Gasket, and Bracket) ✻

| Appearance | Applicable sensor | Model |
|---|---|---|
|  | F3SN-A□□□□P14(-01) | **F39-HP□□□□-14** |
| | F3SN-A□□□□P25(-01)<br>F3SN-A□□□□P40(-01)<br>F3SN-A□□□□P70(-01)<br>F3SN-B□□□□P25<br>F3SN-B□□□□P40<br>F3SN-B□□□□P70 | **F39-HP□□□□-25** |
| | F3SH-A09P03(-01) | **F39-HPH09-03** |

✻ Purchase 2 sets when using both an emitter and a receiver.

## Multi-beam Sensor Support Stands/Mirror Stands

| Appearance | Specification | Model | Remarks |
|---|---|---|---|
|  | Stand unit<br>Materials<br>Base:STKM (base)<br>SUS304 (leaf spring)<br>Pipe, bolts and nuts: SUS304<br>Weight: 11.8 kg | **F39-ST1** | Minimum order quantity: 1 pc.<br>(In total, 2 stands are required for each F3SH-A: one for the emitter and the other for the receiver.) |
|  | Mounting bracket<br>Materials: Aluminum<br>Weight: 250 g | **F39-L22** | Minimum order quantity: 1 pc.<br>(In total, 6 brackets are required for each F3SH-A: 3 units each for emitter and receiver. These brackets are not required for the F39-MLG series reflection mirrors, since these mirrors are supplied together with a specially designed adapter.) |

## Mounting Brackets for Sensors (Optional)

| Appearance | Specification | Model | Remarks |
|---|---|---|---|
|  | Wall mounting bracket<br>Material: Iron (zinc plating) ✻ | **F39-L18** | For emitter: 2 pcs.<br>For receiver: 2 pcs.<br>Total: 4pcs./set |
|  | Free-location bracket<br>Materials: Zinc die-cast (zinc plating)<br>**Note:** Not provided with an angle deflection mechanism for beam control. | **F39-L19** | Minimum order quantity: 1 pc. |
|  | Free-location bracket<br>Materials<br>Sensor fixing element:<br>Zinc die-cast (zinc plating)<br>Mounting bracket: Iron (zinc plating)<br>**Note:** Provided with an angle deflection mechanism for beam control | **F39-L20** | Minimum order quantity: 1 pc. |

✻ Use these brackets for sensors having an operating range where no intermediate bracket is required (with an operating range of less than 640 mm).

## Test Rods (Optional)

| Appearance | Applicable sensor | Specification | Model |
|---|---|---|---|
|  | F3SN-A□□□□P14(-01) | 14 mm-dia. (provided with the sensor) | **F39-TR14** |
| | | Used for checking the setting condition of single-beam floating blanking | **F39-TR23** |
| | | Used for checking the setting condition of two-beam floating blanking | **F39-TR32** |
| | F3SN-A□□□□P25(-01) | 25 mm-dia. (provided with the sensor) | **F39-TR25 ✻1** |
| | | Used for checking the setting condition of single-beam floating blanking | **F39-TR40 ✻2** |

**✻1.** Also provided with the F3SN-B□□□□P25.
**✻2.** Also provided with the F3SN-A□□□□P40 and F3SN-B□□□□P40.

# Specifications (For details, refer to the instruction manual.)

## Main Units

### F3SN-A/F3SH-A

| Model ✻8 | Stand-alone | F3SN-A□□□□P14 ✻1 | F3SN-A□□□□P25 ✻1 | F3SN-A□□□□P40 ✻1 | F3SN-A□□□□P70 ✻1 | F3SH-A09P03 |
|---|---|---|---|---|---|---|
| Item | Series connection | F3SN-A□□□□P14-01 ✻1 ✻2 | F3SN-A□□□□P25-01 ✻1 | F3SN-A□□□□P40-01 ✻1 | F3SN-A□□□□P70-01 ✻1 | F3SH-A09P03-01 |
| Sensor type | | Type 4 Safety Light Curtain | | | | |
| Setting tool connection | | Connectable | | | | |
| Safety category | | Category 4, 3, 2, 1, or B | | | | |
| Detection capability | | Opaque objects: 14 mm in diameter | Opaque objects: 25 mm in diameter | Opaque objects: 40 mm in diameter | Opaque objects: 70 mm in diameter | --- |
| Beam gap (P) | | 9 mm | 15 mm | 30 mm | 60 mm | 300 mm |
| Number of beams (n) | | 21 to 125 (odd numbers only) | 13 to 120 | 7 to 60 | 5 to 30 | 4 |
| Protective height (PH) | | 189 to 1125 mm PH = n × P | 217 to 1822 mm PH = (n – 1) × P + 37 | 217 to 1807 mm PH = (n – 1) × P + 37 | 277 to 1777 mm PH = (n – 1) × P + 37 | --- |
| Outermost beam gap | | --- | | | | 900 mm |
| Lens diameter | | 9 mm × 4.6 mm | Diameter 9 mm | | | |
| Operating range | | 0.2 to 7 m | 0.2 to 10 m | | | |
| Response time (under stable light incident condition) | | ON to OFF: 10 to 15.5 ms max. OFF to ON: 40 to 62 ms max. | | | | ON to OFF: 10 ms max. OFF to ON: 40 ms max. |
| Startup waiting time | | 1 s max. | | | | |
| Power supply voltage (Vs) | | 24 VDC ±10% (ripple p-p 10% max.) | | | | |
| Current consumption (no load) | Emitter | Up to 50 beams: 140 mA max., 51 to 85 beams: 155 mA max., 86 beams and more: 170 mA max. | | | | 140 mA max. |
| | Receiver | Up to 50 beams: 100 mA max., 51 to 85 beams: 110 mA max., 86 beams and more: 120 mA max. | | | | 100 mA max. |
| Light source (emitted wavelength) | | Infrared LED (870 nm) | | | | |
| Effective aperture angle (EAA) | | Within ±2.5° for the emitter and receiver at a detection distance of at least 3 m according to IEC 61496-2 | | | | |
| Control outputs (OSSD) | | Two PNP transistor outputs, load current 300 mA max., residual voltage 2 V max. (except for voltage drop due to cable extension), allowable capacity load 0.075 μF, leak current 2 mA max. | | | | |
| Auxiliary output (non-safety output) | | One PNP transistor output, load current 50 mA max., residual voltage 2 V max. (except for voltage drop due to cable extension) | | | | |
| External indicator output (non-safety output) ✻3 | | One PNP transistor output, load current 40 mA max., residual voltage 2 V max. (except for voltage drop due to cable extension) | | | | |
| Output operation mode | | Control output: Light-ON<br>Auxiliary output: Dark-ON (can be changed by the F39-MC11)<br>External indicator output: Light-ON (can be changed by the F39-MC11) ✻3 | | | | |
| Input voltage | | Test input, interlock selection input, reset input, and external relay monitor input voltages; ON voltage: 9 to 24 V (with a sink current 3 mA max.), OFF voltage: 0 to 1.5 V or open | | | | |
| Indicators | Emitter | Power indicator (green), interlock indicator (yellow), lockout indicator (red), test indicator (orange), error mode indicator (3 red), light intensity level indicator (green: 5 levels) | | | | |
| | Receiver | OFF-state indicator (red), ON-state indicator (green), lockout indicator (red), blanking indicator (green: F3SN-A only), Power indicator (green: F3SH-A only), error mode indicator (3 red), light intensity level indicator (green: 5 levels) | | | | |
| Mutual interference prevention function ✻3 | | Time-shared beam projection system by series connection | | | | |
| Series connections | | • Number of series connected light curtains: Up to 3 sets<br>• Number of beams: Up to 240 beams<br>• Length of the series connection cable: 3 m max. | | | | |
| Test functions | | • Self test (when power is turned ON and while power is supplied, one cycle during response time)<br>• External test (emission stop function by test input) | | | | |
| Safety functions | | • Auto-reset/manual reset (interlock) ✻4<br>• EDM (External Device Monitor)<br>• Fixed blanking ✻5<br>• Floating blanking ✻5 | | | | • Auto-reset/manual reset (interlock) ✻4<br>• EDM (External Device Monitor) |
| Connection method | | M12 connector (8 pins) | | | | |
| Protective circuits | | Output short-circuit protection, power supply reverse polarity protection | | | | |
| Ambient temperature | | Operating: –10 to 55°C, storage: –30 to 70°C (with no icing or condensation) | | | | |
| Ambient humidity | | Operating/storage: 35% to 95% (with no condensation) | | | | |
| Ambient operating light intensity | | Incandescent lamp: 3000 lx max. (light intensity on the receiver surface)<br>Sunlight: 10000 lx max. (light intensity on the receiver surface) | | | | |
| Insulation resistance | | 20 MΩ min. (at 500 VDC) | | | | |
| Dielectric strength | | 1000 VAC 50/60 Hz 1 min. | | | | |
| Degree of protection | | IEC Standard IP65 | | | | |
| Vibration resistance | | Malfunction: 10 to 55 Hz, 0.7-mm double amplitude, 20 sweeps in X, Y and Z directions | | | | |
| Shock resistance | | Malfunction: 100 m/s², 1000 times in X, Y and Z directions | | | | |

| Item \ Model ✻8 | Stand-alone | F3SN-A□□□□P14 ✻1 | F3SN-A□□□□P25 ✻1 | F3SN-A□□□□P40 ✻1 | F3SN-A□□□□P70 ✻1 | F3SH-A09P03 |
|---|---|---|---|---|---|---|
| | Series connection | F3SN-A□□□□P14-01 ✻1 ✻2 | F3SN-A□□□□P25-01 ✻1 | F3SN-A□□□□P40-01 ✻1 | F3SN-A□□□□P70-01 ✻1 | F3SH-A09P03-01 |
| **Materials** | | Case: Aluminum, end cap: Zinc die-cast, optical cover: PMMA (acrylic resin), Cable: Oil-resistant PVC | | | | |
| **Weight (packed state)** | | Weight (g) = (Detection width) × 2.4 + α + β<br>Detection width of 189 to 639 mm: α = 700, Detection width of 652 to 1,267 mm: α = 800,<br>Detection width of 1,282 to 1,822 mm: α = 900,<br>Model with no suffix or –01: β = 0, Model with suffix –02, –03, or –05: β = 100, Model with suffix –04: β = 200 | | | | |
| **Accessories** | | Test rod ✻6, instruction manual, error mode label, mounting brackets (top and bottom),<br>mounting brackets (intermediate) ✻7 | | | | |
| **Applicable standards** | | IEC61496-1, EN61496-1 Type 4 ESPE (Electro-Sensitive Protective Equipment)<br>IEC61496-2 Type 4 AOPD (Active Opto-electronic Protective Devices) | | | | |

**✻1.** The 4 digits in □□□□ in the model number represent the protective height. Use the formula given in the information on protective height specifications to calculate the height.
For example, if the beam gap is 9 mm, and the No. of beams is 21, the protective height will be 9 × 21 = 189 mm. The model with this protective height is F3SN-A0189P14.

**✻2.** F3SN-A□□□□P14-01 is a customized model. Consult with your dealer or OMRON representative when ordering this model.

**✻3.** Only models ending in -01, -03, -04, or -05 have this output and functionality.

**✻4.** For the factory setting, the manual reset mode is set to the “start/restart” interlock.
Using the F39-MC11 can select either the start interlock or the restart interlock.

**✻5.** For the factory setting, the function is not set. It can be enabled with the F39-MC11.

**✻6.** Not provided with the F3SN-A□□□□P70 and F3SH-A.

**✻7.** The intermediate mounting bracket is supplied with the following types:
Types which have the total length of the light curtain from 640 mm to 1280 mm: 1 set for each of emitter and receiver.
Types which have the total length of the light curtain over 1280 mm: 2 sets for each of emitter and receiver.

**✻8.** Models with different connector configurations are also available as options. Refer to *“Many Connector Variations”* on page 379.

## F3SN-B ( Different from specifications of F3SN-A)

| Item \ Model ✻6 | | F3SN-B□□□□P25 | F3SN-B□□□□P40 | F3SN-B□□□□P70 |
|---|---|---|---|---|
| Sensor type | | Type 2 Safety Light Curtain | | |
| Setting tool connection | | Not connectable | | |
| Safety category | | Category 2, 1, or B | | |
| Detection capability | | Opaque objects:<br>25 mm in diameter | Opaque objects:<br>40 mm in diameter | Opaque objects:<br>70 mm in diameter |
| Beam gap (P) | | 15 mm | 30 mm | 60 mm |
| Number of beams (n) | | 13 to 119 (noncontinuous) | 7 to 60 (noncontinuous) | 5 to 30 |
| Protective height (PH) | | 217 to 1807 mm<br>PH = (n – 1) × P + 37 mm | 217 to 1807 mm<br>PH = (n – 1) × P + 37 mm | 277 to 1777 mm<br>PH = (n – 1) × P + 37 mm |
| Lens diameter | | Diameter 9 mm | | |
| Operating range | | 0.2 to 10.0 m | | |
| Response time (under stable light incident condition) | | ON to OFF: 10 to 15 ms max.<br>OFF to ON: 40 to 60 ms max. | | |
| Startup waiting time | | 1 s max. | | |
| Power supply voltage (Vs) | | 24 VDC ±10% (ripple p-p 10% max.) | | |
| Current consumption (no load) | Emitter | Up to 50 beams: 140 mA max., 51 to 85 beams: 155 mA max., 86 beams and more: 170 mA max. | | |
| | Receiver | Up to 50 beams: 100 mA max., 51 to 85 beams: 110 mA max., 86 beams and more: 120 mA max. | | |
| Light source (emitted wavelength) | | Infrared LED (870 nm) | | |
| Effective aperture angle (EAA) | | Within ±5° for the emitter and receiver at a detection distance of at least 3 m according to IEC 61496-2 | | |
| Control outputs (OSSD) ✻1 | | Two PNP transistor outputs, load current 300 mA max., residual voltage 2 V max.<br>(except for voltage drop due to cable extension) , allowable capacity load 0.075 μ F, leak current 2 mA max. | | |
| Auxiliary output (non-safety output) | | One PNP transistor output, load current 50 mA max., residual voltage 2 V max.<br>(except for voltage drop due to cable extension) | | |
| Output operation mode ✻1 | | Control output: Light-ON, Auxiliary output: Dark-ON | | |
| Input voltage | | For test input, interlock selection input, reset input, and external relay monitor input voltages;<br>ON voltage: 9 to 24 V (sink current: 3 mA max.), OFF voltage: 0 to 1.5 V or open | | |
| Indicators | Emitter | Power indicator (green), interlock indicator (yellow), lockout indicator (red), test indicator (orange), error mode indicator (3 red), light intensity level indicator (green: 5 levels) | | |
| | Receiver | OFF-state indicator (red), ON-state indicator (green), lockout indicator (red), Optional function indicator (green), error mode indicator (3 red), light intensity level indicator (green: 5 levels) | | |
| Mutual interference prevention function | | Time-shared beam projection system by series connection | | |
| Series connections | | • Number of series connected light curtains: Up to 3 sets<br>• Number of beams: Up to 240 beams<br>• Length of the series connection cable: 3 m max. | | |
| Test functions | | • Self test (when power is ON and period is 1 s or less)<br>• External test (light emission stop function by test input) | | |
| Safety functions ✻2 ✻3 | | • Auto-reset/manual reset (start/restart interlock)<br>• EDM (External Device Monitor) | | |
| Connection method | | M12 connector (8 pins) | | |
| Protective circuits | | Output short-circuit protection, reverse polarity protection | | |
| Ambient temperature | | Operating: –10 to 55°C, storage: –30 to 70°C (with no icing or condensation) | | |
| Ambient humidity | | Operating/storage: 35% to 95% (with no condensation) | | |
| Ambient operating light intensity | | Incandescent lamp: 3000 lx max. (light intensity on the receiver surface)<br>Sunlight: 10000 lx max. (light intensity on the receiver surface) | | |
| Insulation resistance | | 20 MΩ min. (at 500 VDC) | | |
| Dielectric strength | | 1000 VAC 50/60 Hz 1 min. | | |
| Degree of protection | | IEC Standard IP65 | | |
| Vibration resistance | | Malfunction: 10 to 55 Hz, 0.7-mm double amplitude, 20 sweeps in X, Y and Z directions | | |
| Shock resistance | | Malfunction: 100 $m/s^2$, 1000 times in X, Y and Z directions | | |
| Materials | | Case: Aluminum, end cap: Zinc die-cast, optical cover: PMMA (Acrylic resin) | | |
| Weight (packed state) | | Weight (g) = (Detection width) × 2.4 + α + β<br>Detection width of 189 to 639 mm: α = 700, Detection width of 652 to 1,267 mm: α = 800,<br>Detection width of 1,282 to 1,822 mm: α = 900,<br>Model with no suffix or –01: β = 0, Model with suffix –02, –03, or –05: β = 100, Model with suffix –04: β = 200 | | |
| Accessories | | Test rod ✻4, instruction manual, mounting brackets (top and bottom),<br>mounting brackets (intermediate) ✻5, error mode label | | |
| Applicable standards | | IEC61496-1, EN61496-1 Type 2 ESPE (Electro-Sensitive Protective Equipment)<br>IEC61496-2 Type 2 AOPD (Active Opto-electronic Protective Devices) | | |

✻1. A safety circuit has been adopted. Please note that the control logic (ON/OFF) may differ from conventionally used logic.
✻2. The manual reset mode is set to the "start/restart" interlock. It is impossible to select interlock only or restart interlock only.
✻3. No floating blanking or fixed blanking function is provided.
✻4. Not provided with the F3SN-B□□□□P70.
✻5. The intermediate mounting bracket is supplied with the following types:
Types which have the total length of the light curtain from 640 mm to 1280 mm: 1 set for each of emitter and receiver.
Types which have the total length of the light curtain over 1280 mm: 2 sets for each of emitter and receiver.
✻6. Models with different connector configurations are also available as options. Refer to *"Many Connector Variations"* on page 379.

# Accessories

## Control Units

| Item / Model | | F3SP-B1P | G9SA-300-SC ✻ |
|---|---|---|---|
| Applicable sensor | | F3SN-A, F3SN-B, F3SH-A | |
| Supply voltage | | 24 VDC ±10% | |
| Power consumption | | 1.7 W DC max. (does not include the sensor's current consumption) | 24 VDC: 0.7 W DC max. (does not include the sensor's current consumption) |
| Operating time | | 100 ms max. (does not include the sensor's response time) | 300 ms max. (does not include the sensor's response time and bounce time) |
| Response time | | 10 ms max. (does not include the sensor's response time) | 10 ms max. (does not include the sensor's response time and bounce time) |
| Relay output | No. of contact | 3 NO + 1 NC | 3 NO |
| | Rated load | 25 VAC, 5 A (cos diameter = 1), 30 VDC, 5 A L/R = 0 ms | 250 VAC, 5 A |
| | Rated carry voltage | 5 A | |
| Connection method | Between sensor's | M12 connector (8 pins) | |
| | Other | Terminal block | |
| Weight (packed state) | | Approx. 280 g | Approx. 300 g |
| Accessory | | Instruction manual | |

✻ For further details on the G9SA-300-SC, refer to the page 557 instruction manual.

## Setting Console

| Item / Model | F39-MC11 |
|---|---|
| Applicable sensor | F3SN-A, F3SH-A |
| Supply voltage | 24 VDC ±10% (provided from the sensor) |
| Connection method | Cable (included) |
| Weight (packed state) | 360 g |
| Accessories | One branching connector, 2-m cable, one connector cap, instruction manual |

**For details on the setting console, refer to the instruction manual provided with the product.**

## External Indicators

| Model / Item | F39-A01PR-L (Emitter) F39-A01PR-D (Receiver) | F39-A01PG-L (Emitter) F39-A01PG-D (Receiver) |
|---|---|---|
| Applicable sensor | F3SN-A□□□□P□□-01(-03, -04, -05) ✻ F3SH-A09P03-01 | |
| Light source | Red LED | Green LED |
| Supply voltage | 24 VDC ±10% (provided from the sensor) | |
| Current consumption | 50 mA max. (provided from the sensor) | |
| Connection method | M12 connector (8 pins) | |
| Weight (packed state) | Approx. 80 g | |

✻ The indicator must be secured separately for models ending in "-04" or "-05." For the F3SN-B, only light-ON mode can be used.

## Spatter Protection Slit Covers

| Item / Model | | F39-HS□□□□A-14 | F39-HS□□□□B-14 | F39-HS□□□□A-25 F39-HSH09A-03 | F39-HS□□□□B-25 F39-HSH09B-03 |
|---|---|---|---|---|---|
| Applicable sensor | | F3SN-A□□□□P14(-01) | | F3SN-A□□□□P□□(-01), F3SN-B□□□□P□□(-01), F3SH-A09P03(-01) | |
| Operating range (typical value) ✻ | When one cover is used | 3 m | 2 m | 5.5 m | 3.5 m |
| | When two covers are used | 1 m | 0.5 m | 2 m | 1 m |
| Distance that does not cause mutual interference (typical value) | When one cover is used | 6.5 m | 4.8 m | 12.2 m | 7.8 m |
| | When two covers are used | 2.4 m | 1.2 m | 4.4 m | 2.1 m |

✻ The maximum distance that can turn ON all of the five light intensity level indicators.

## Environment-resistant Enclosures

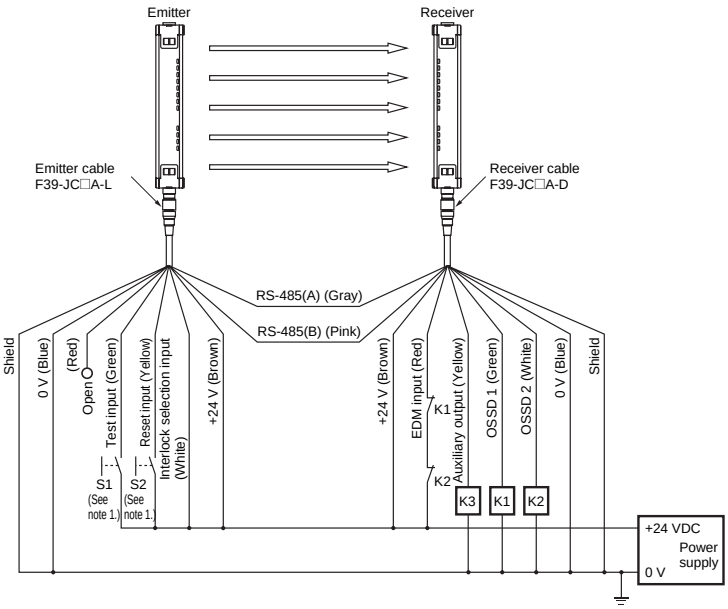
| Item / Model | F39-HP□□□□-14 | F39-HP□□□□-25 F39-HPH09-03 |
|---|---|---|
| Applicable sensor | F3SN-A□□□□P14(-01) | F3SN-A□□□□P□□(-01), F3SN-B□□□□P□□(-01), F3SH-A09P03(-01) |
| Operating range characteristics | 0.2 to 6 m | 0.2 to 10 m |
| Degree of protection ✻ | IP67 (IEC60529) | |
| Materials | Case: Acrylic resin, rubber: NBR60, mounting bracket: SUS316L, screw: SUS316L | |

✻ To conform to IP67, tighten the screws according to the "Cautions for Use" as described in the manual packaged together with the product.

# Connections

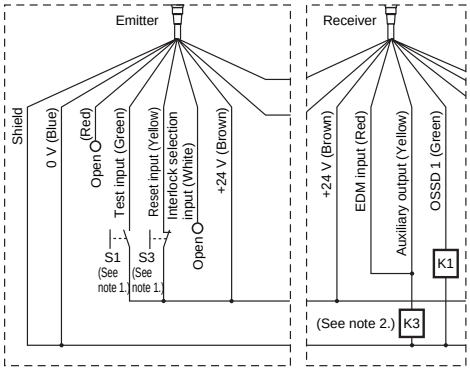
## Wiring for Sensor Only Configuration

### Wiring for the Manual Reset Mode and the EDM Function




S1: External test switch
S2: Interlock/lockout reset switch
S3: Lockout reset switch (If the switch is not necessary, connect between the reset input and +24 VDC.)
K1, K2: Relay that control the dangerous zone, etc.
K3: Load, PLC, etc. (used for monitoring)

### Wiring for the Auto-reset Mode




### When the EDM is Not Used

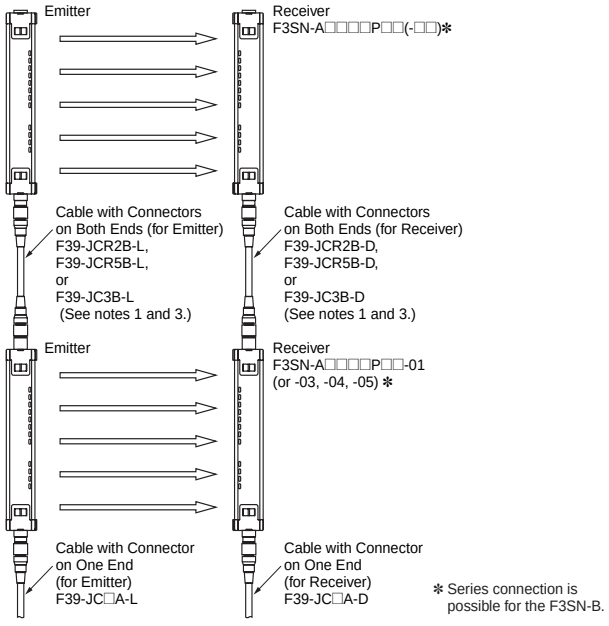
When the EDM is not necessary
(1) Use the F39-MC11 to disable the EDM.
or
(2) Disable the EDM by changing the wiring as shown in the figure below, when the auxiliary output is Dark ON.

**Note: 1.** Use very low load type switches.
**2.** If K3 is not necessary, short-circuit the auxiliary output with the EDM input.

## Series Connection (Up to 3 Sets)

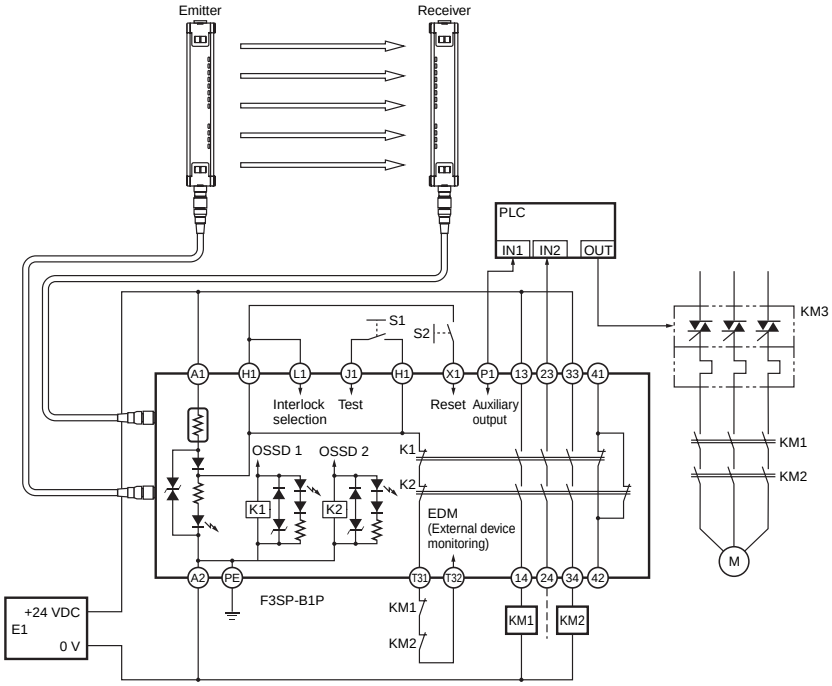
Using series connection models (model numbers ending in -01, -03, -04, -05) enables series connection as shown in the figure at the right. Either stand-alone models and the series connection models can be used for the light curtains located at the top end.

**Note: 1.** To maintain sensor performance, please use double-ended connector cables for series connection which are the length of F39-JC3B or shorter. Double-ended connector cables that are longer than F39-JC7B cannot be used for series connection.
**2.** The F3SN and F3SH cannot be connected in series.
**3.** Series connection is possible for model numbers ending in -04 or -05 (with 0.2 m cable with connectors).
Refer to page 379.



## An Example of Safety Circuits Where the F3SP-B1P Controller is Used

### For category 4 rating (F3SN-A, F3SH-A)/category 2 rating (F3SN-B)

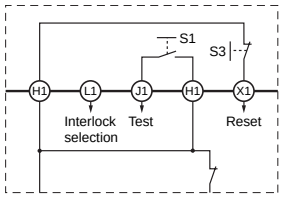



**Applicable operation mode**

- Manual reset mode

S1: External test switch
S2: Interlock/lockout reset switch
S3: Lockout reset switch (If the switch is not necessary, connect between X1 and H1.)
KM1, KM2: Magnetic contactor
KM3: Solid-state contactor (G3J)
M: 3-phase motor
E1: 24 VDC power supply (S82K)
PLC: Programmable controller (Used for monitoring. This is not a part of a safety system.)

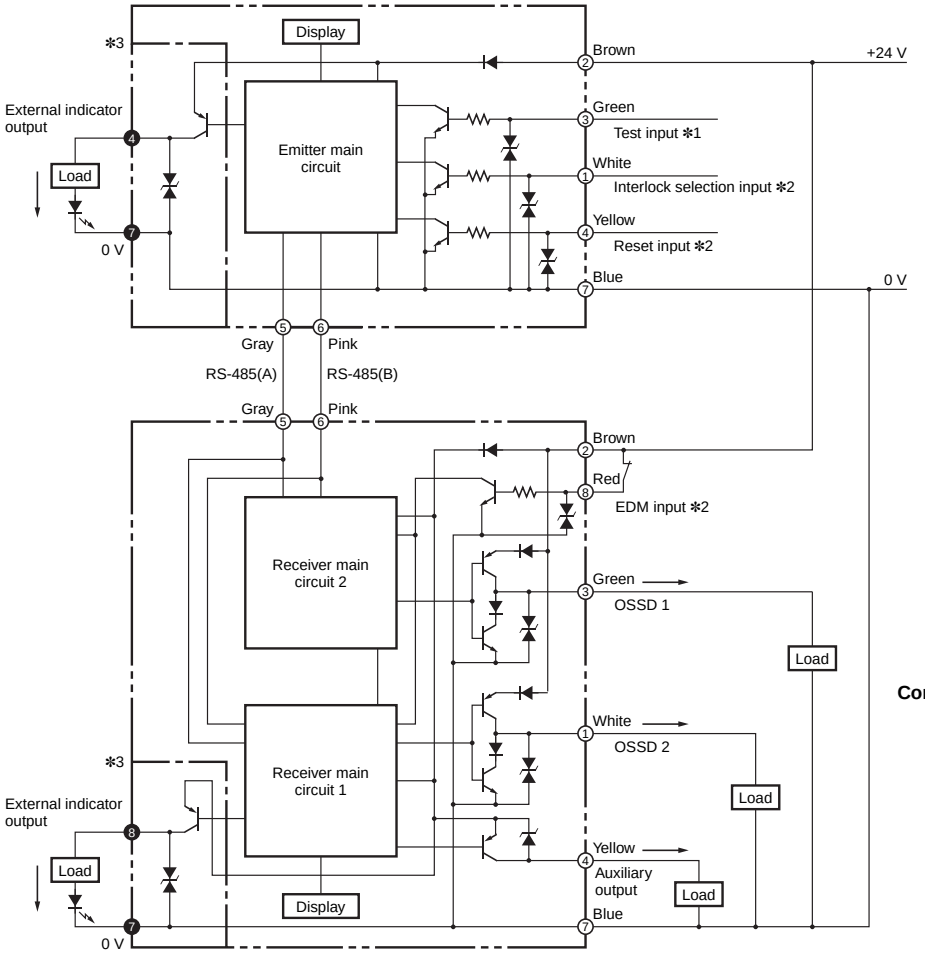
### Wiring for the Auto-reset mode




**Note: 1.** If the EDM is not necessary, short-circuit T31 and T32.
**2.** For the number and arrangement of all terminals on the F3SP-B1P, see the instruction manual packaged together with the F3SP-B1P.

# I/O Circuit Diagrams

## Internal Circuit Diagram




**Connector Pins Arrangement**



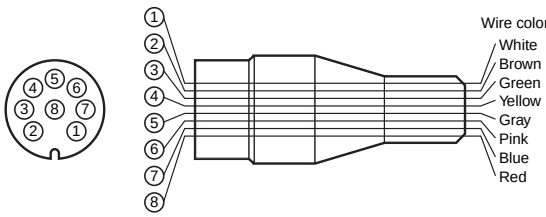
**Note:** The numbers in ❍ indicate pin numbers of the connectors.
The numbers in ● indicate pin numbers of the series connection connectors.

**∗1.** Open: normal light emission, short to the +24 VDC: stops light emission

**∗2.** Refer to *"Connections", "Wiring for Sensor Only Configuration"* on page 390.

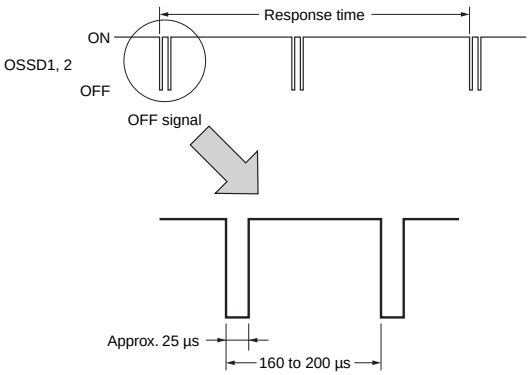
**∗3.** The section encircled with the dashed line is applied for models ending in -01, -03, -04, or -05 only.

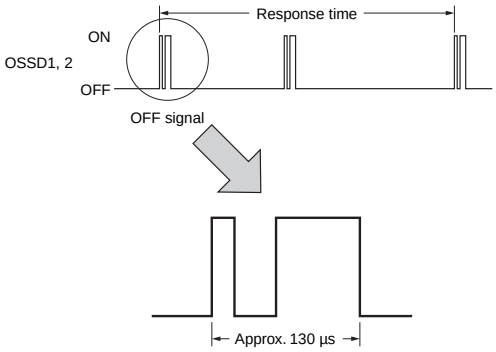
## Cables with Connector on One End

| Model | Internal wiring | Pin No. | Wire color | Signal name | |
|---|---|---|---|---|---|
| | | | | Receiver | Emitter |
| F39-JCR5A (0.5 m)<br>F39-JC3A (3 m)<br>F39-JC7A (7 m)<br>F39-JC10A (10 m)<br>F39-JC15A (15 m) |  | 1 | White | OSSD 2 | Interlock selection input |
| | | 2 | Brown | +24 V | +24 V |
| | | 3 | Green | OSSD 1 | Test input |
| | | 4 | Yellow | Auxiliary output | Reset input |
| | | 5 | Gray | RS-485(A) | RS-485(A) |
| | | 6 | Pink | RS-485(B) | RS-485(B) |
| | | 7 | Blue | 0 V | 0 V |
| | | 8 | Red | EDM input | N.C. |

## Output waveform of the OSSD outputs

The OSSD outputs will be OFF as shown in the following figure in order to perform the OSSD circuit self-test when the light curtain is in the ON-state.
The OSSD circuit diagnosis is correct when this OFF signal is fed back. If the output signal does not contain an OFF signal, the receiver determines that there is an output circuit or wiring failure and goes into the lockout condition.
The number of OFF signals depends on the number of light curtains connected in series. (See the chart at left.)
In the same way, the OSSD outputs will be ON as shown in the following figure, to perform the OSSD circuit self-test when the light curtain is in the OFF-state. (See the chart below.)
Check the input response time of a machine connected to the F3SN-A carefully to ensure the machine will not malfunction due to the OFF signal.



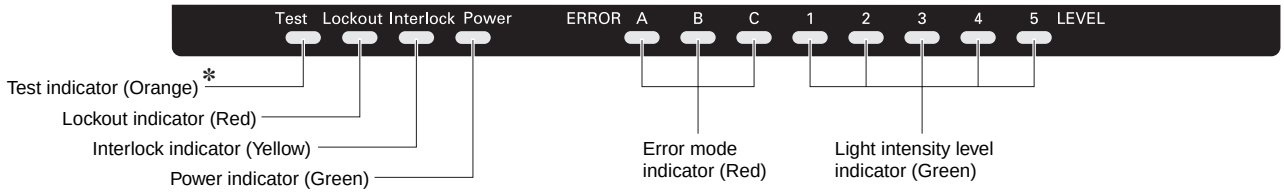

**Note:** This chart indicates the instance of 2 light curtains series connection.

| No. of light curtains connected in series | No. of OFF signals within the response time |
|---|---|
| No | 1 |
| 2 light curtains | 2 |
| 3 light curtains | 3 |

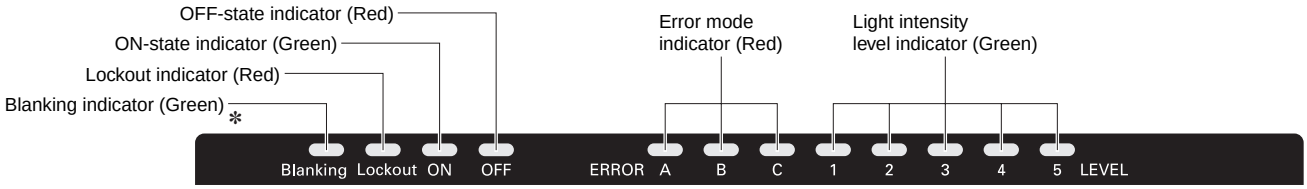
| No. of light curtains connected in series | No. of ON signals within the response time |
|---|---|
| No | 1 |
| 2 light curtains | 2 |
| 3 light curtains | 3 |

# Names and Functions of Parts

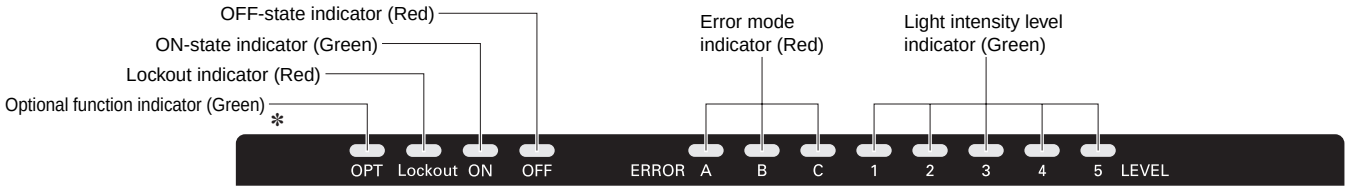
## Emitter (F3SN-A/ F3SN-B/ F3SH-A)



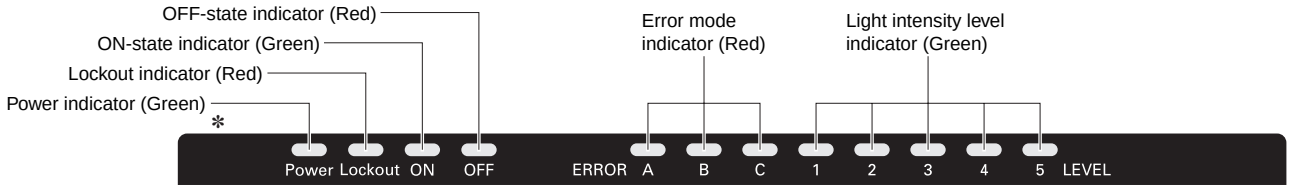

## Receiver (F3SN-A)




## Receiver (F3SN-B)




## Receiver (F3SH-A)




✻ These indicators flash to indicate the need for preventive maintenance when the total ON time exceeds 30,000 hours. (Models without this flashing function are also available as options. An “-NT” to the model number. Ask your OMRON representative for details.)

# Function

| | |
|---|---|
| **Power indicator** | Lit when power is supplied (always lit): F3SN-A, F3SH-A Emitter<br>Lit when power is supplied, flashing when the F39-MC11 is connected: F3SH-A Receiver ✻ |
| **Interlock indicator** | Lit during interlock condition |
| **Lockout indicator** | Flashing during lockout condition |
| **Test indicator** | Lit during external test ✻ |
| **ON-state indicator** | Lit when OSSD outputs are in ON-state |
| **OFF-state indicator** | Lit when OSSD outputs are in OFF-state |
| **Blanking indicator (F3SN-A only)** | Lit when blanking is set, flashing when the F39-MC11 is connected ✻ |
| **Optional function indicator (F3SN-B only)** | Flashing after a lapse of 30,000 hours |

✻ These indicators flash to indicate the need for preventive maintenance when the total ON time exceeds 30,000 hours. (Models without this flashing function are also available as options. An "-NT" to the model number. Ask your OMRON representative for details.)

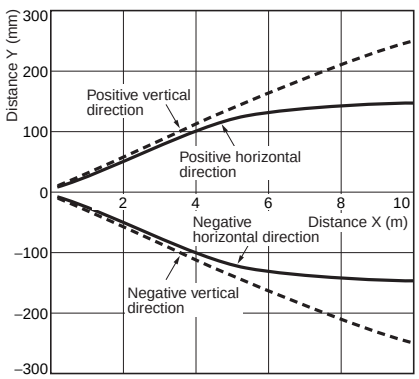
| | 1 | 2 | 3 | 4 | 5 | Light intensity level |
|---|---|---|---|---|---|---|
| Light intensity level indicator<br>Lit / Not lit | ● | ● | ● | ● | ● | 200% and above of ON threshold level |
| | ● | ● | ● | ● | ○ | 150 to 200% of ON threshold level |
| | ● | ● | ● | ○ | ○ | 100 to 150% of ON threshold level |
| | ● | ● | ○ | ○ | ○ | 75 to 100% of ON threshold level |
| | ● | ○ | ○ | ○ | ○ | 50 to 75% of ON threshold level |
| | ○ | ○ | ○ | ○ | ○ | Less than 50% of ON threshold level |

| | A | B | C | Cause of error |
|---|---|---|---|---|
| Error mode indicator<br>Flashing / Not lit | ● | ○ | ○ | The Interlock selection input line or the reset input line is not wired correctly or became open. |
| | ○ | ● | ○ | Relay contact is welded. Releasing time of the relay takes too long.<br>The EDM input line is not wired correctly or became open. |
| | ○ | ○ | ● | Communication line (RS-485) is not wired correctly, became open, or causes other errors. |
| | ● | ● | ○ | One of the OSSD outputs is shorted or is not wired correctly.<br>Other failure in OSSD outputs. |
| | ○ | ● | ● | Mutual interference. Interference light is received. |
| | ● | ○ | ● | Types of the receiver and emitter are not the same.<br>Numbers of the receiver and emitter connected in series are not the same. |
| | ● | ● | ● | External noise. Internal hardware failure of the receiver or the emitter. |

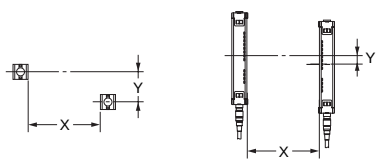
# Engineering Data (Typical Examples)

## Parallel operating range

**F3SN-A1107P14**

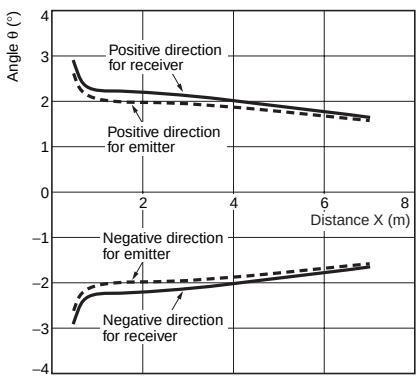


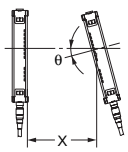

**Horizontal direction** **Vertical direction**




## Angular range (Angle of elevation)

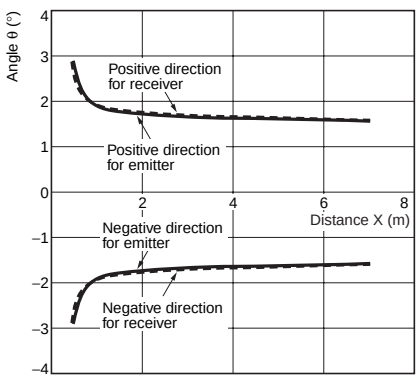
**F3SN-A1107P14**

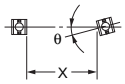



## Angular range (Angle of rotation)

**F3SN-A1107P14**



# Dimensions

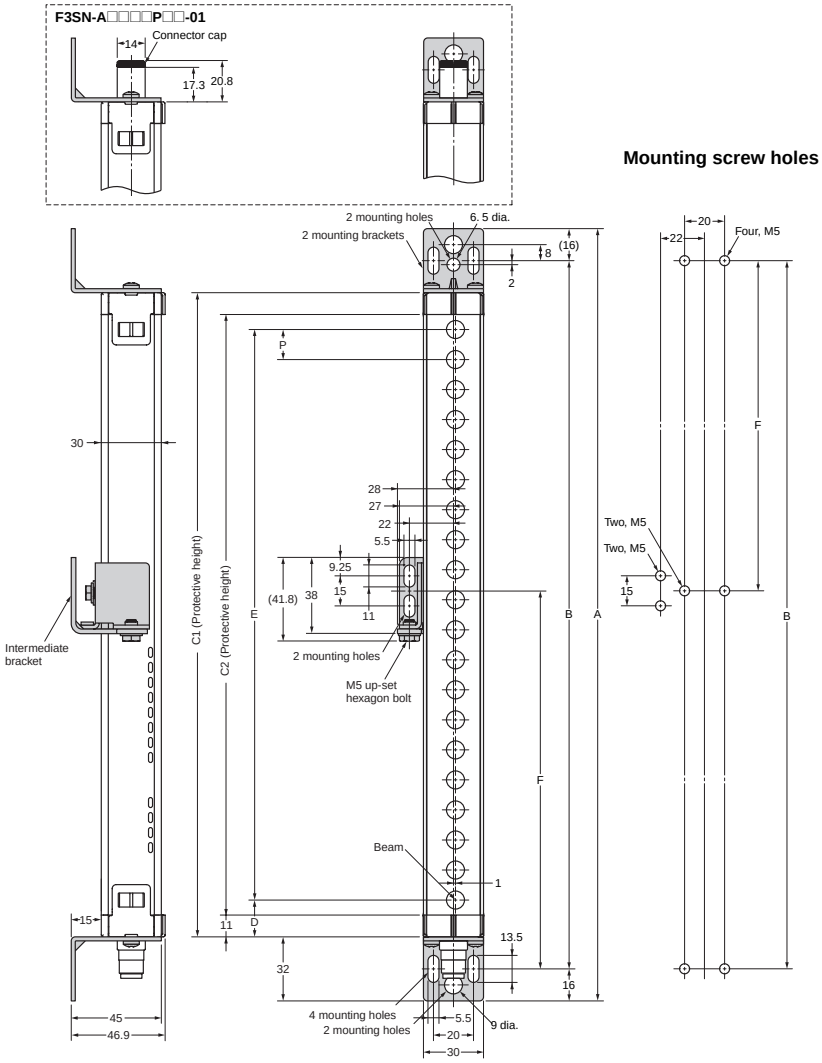
(Unit: mm)

## Main Units

Refer to the User's Manual (SCEE-713) for the dimensions of models with different connector configurations (model numbers ending in "-02" to "-05").

**F3SN-A□□□□P□□(-01)**
**F3SN-B□□□□P□□(-01)**






Dimensions according to the model can be calculated by using the following equations.

- F3SN-A□□□□P14(-01)
  Dimension C2 (protective height): 4 digits in the model name
  Dimension A = C2 + 86
  Dimension B = C2 + 54
  Dimension D = 15.5
  Dimension E = C2 – 9
  Dimension F: See the table below.
  Dimension P = 9

| C2 (protective height) | Number of intermediate Mounting Bracket | Dimension F (See note.) |
|---|---|---|
| to 0620 | 0 | --- |
| 0621 to 1125 | 1 | F = B/2 |

**Note:** If value F obtained from the above equation is not used, set F to 670 mm or less.

- F3SN-A□□□□P25(-01)/P40(-01)/P70(-01), F3SN-B□□□□P25(-01)/P40(-01)/P70(-01)
  Dimension C1 (protective height): 4 digits in the model name
  Dimension A = C1 + 64
  Dimension B = C1 + 32
  Dimension D = 18.5
  Dimension E = C1 – 37
  Dimension F: See the table below.

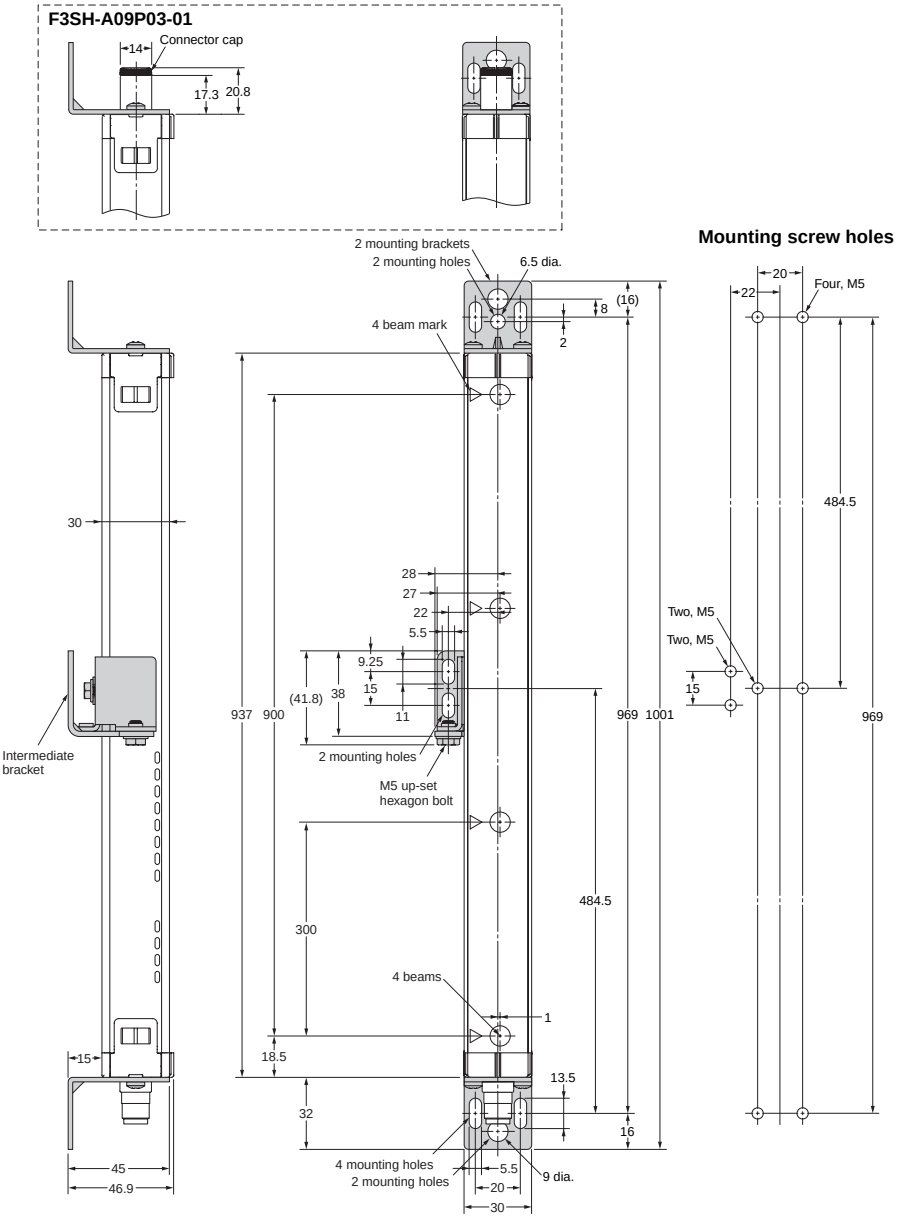
| C1 (protective height) | Number of intermediate Mounting Bracket | Dimension F (See note.) |
|---|---|---|
| to 0640 | 0 | --- |
| 0641 to 1280 | 1 | F = B/2 |
| 1281 to 1822 | 2 | F = B/3 |

Dimension P: See the table below.

| Detection capability | Dimension P |
|---|---|
| 25 | 15 |
| 40 | 30 |
| 70 | 60 |

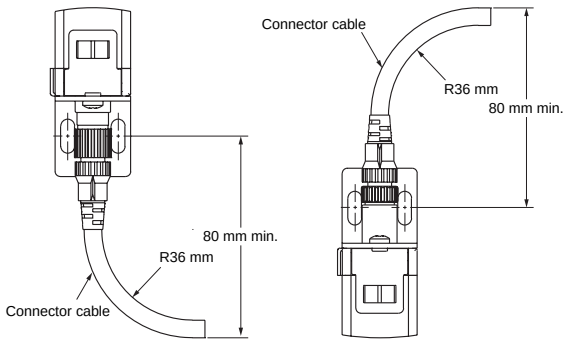
**F3SH-A09P03**
**F3SH-A09P03-01**






## Mounting Precautions

1. The intermediate bracket (3) (see Mounting brackets (intermediate)) is shown on the left-hand side of the sensor as an example. If the intermediate bracket (3) is on the right-hand side of the sensor then the mounting holes must also be on the right-hand side.
2. When using with the cable bent, allow at least the dimensions shown on the right. (Minimum bending radius of cable: R36 mm.)



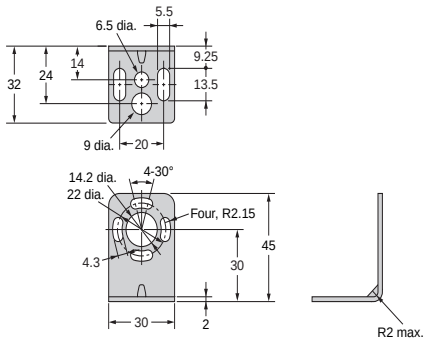
## Accessories

### Mounting Bracket (Top and Bottom)



Material: Iron (zinc plating)

**Note:** Provided with the product.

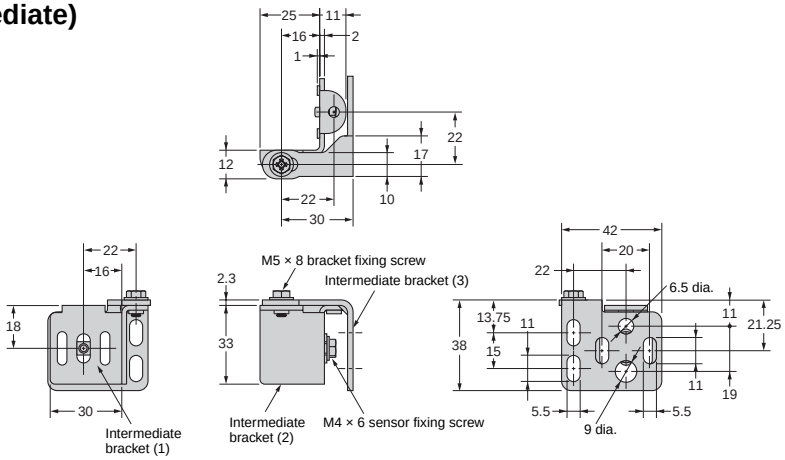



### Mounting Brackets (Intermediate)



Material: Iron (zinc plating)

**Note:** Provided with the product.
The number of brackets required depends on the total length of the Sensor.



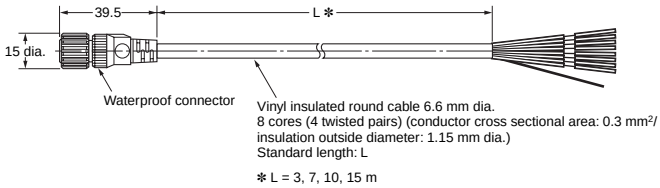

## Accessories (Optional)

### Cables with Connector on One End

**F39-JCR5A (L = 0.5 m)** **F39-JC10A (L = 10 m)**
**F39-JC3A (L = 3 m)** **F39-JC15A (L = 15 m)**
**F39-JC7A (L = 7 m)**



Color: Emitter (gray)
Receiver (black)

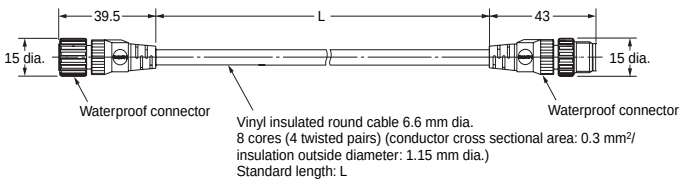



### Cables with Connectors on Both Ends

**F39-JCR2B (L = 0.2 m)** **F39-JC7B (L = 7 m)** **F39-JC40B (L = 40 m)** **F39-JC10C (L = 10 m)**
**F39-JCR5B (L = 0.5 m)** **F39-JC10B (L = 10 m)** **F39-JCR2C (L = 0.2 m)** **F39-JC15C (L = 15 m)**
**F39-JC1B (L = 1 m)** **F39-JC15B (L = 15 m)** **F39-JC1C (L = 1 m)**
**F39-JC3B (L = 3 m)** **F39-JC20B (L = 20 m)** **F39-JC3C (L = 3 m)**
**F39-JC5B (L = 5 m)** **F39-JC30B (L = 30 m)** **F39-JC7C (L = 7 m)**



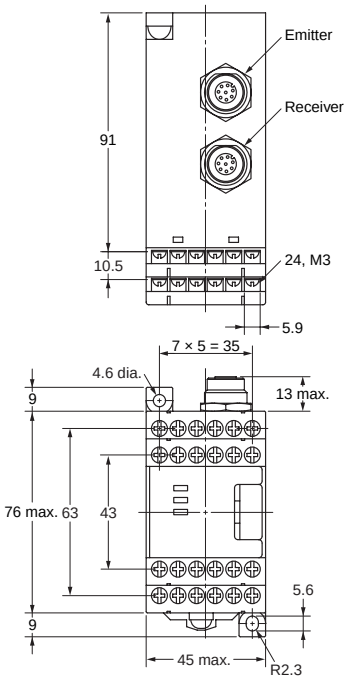
Color: Emitter (gray)
Receiver (black)



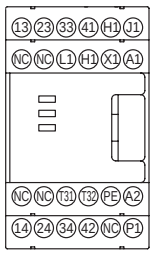
## Control Unit

### F3SP-B1P

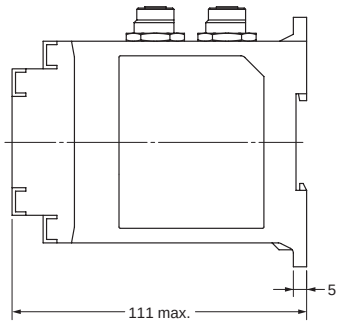




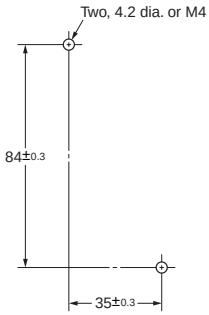

Terminal Allocations




Indicators:
PWR (green), K1 (orange), K2 (orange)



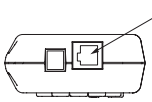

**Mounting screw holes**

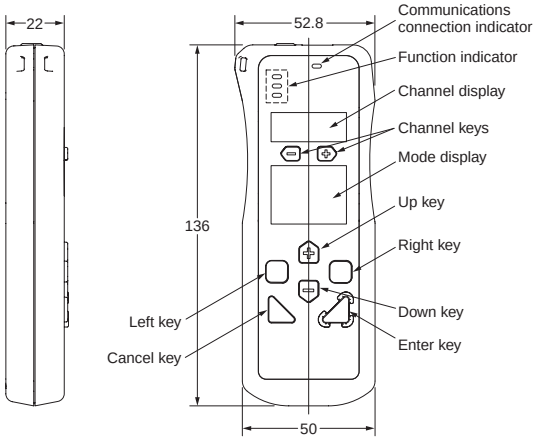


## Setting Console

**F39-MC11**



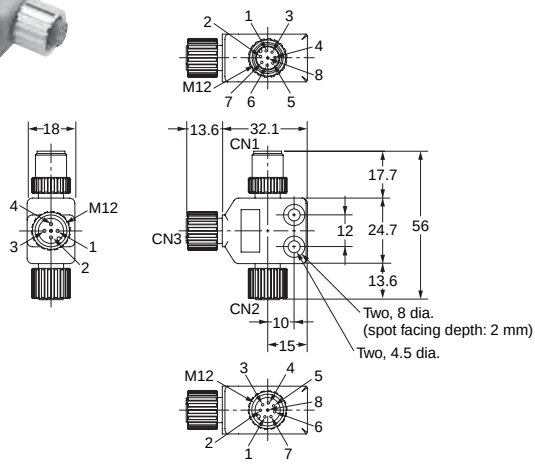



## Branching Connector (supplied with F39-MC11)

**F39-CN1**



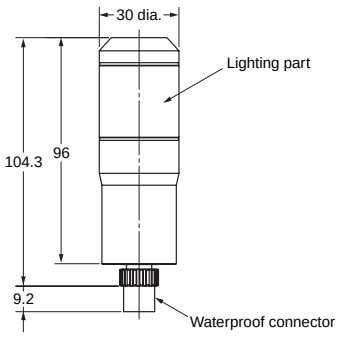



| | |
|---|---|
| **CN1** | Connector cable |
| **CN2** | Sensor |
| **CN3** | Setting console |

## External Indicators

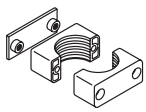
**F39-A01PR-L/-D**
**F39-A01PG-L/-D**



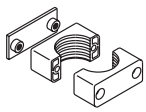


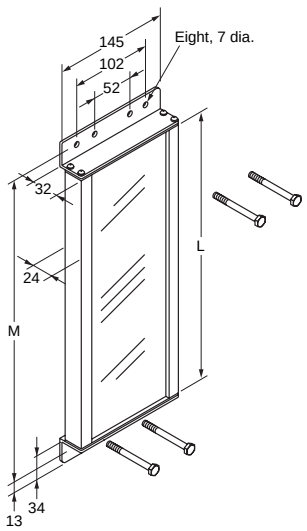

## Mirrors

**F39-MLG□**



Can be fitted to the F39-ST1 cylindrical mounting rod (42 dia. ±1) (accessory).

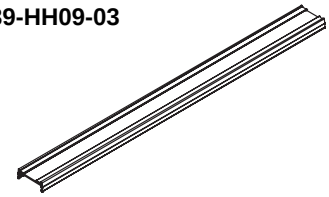




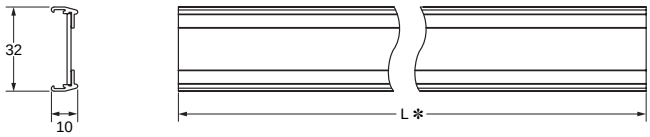

| Model | L (mm) | M (mm) |
|---|---|---|
| F39-MLG0406 | 445 | 487 |
| F39-MLG0610 | 648 | 690 |
| F39-MLG0711 | 749 | 792 |
| F39-MLG0914 | 953 | 995 |
| F39-MLG1067 | 1105 | 1148 |
| F39-MLG1219 | 1257 | 1300 |
| F39-MLG1422 | 1461 | 1503 |
| F39-MLG1626 | 1664 | 1706 |
| F39-MLG1830 | 1867 | 1910 |
| F39-MLG2134 | 2172 | 2214 |

## Spatter Protection Covers

**F39-HN□□□□-14**
**F39-HN□□□□-25**
**F39-HH09-03**



**Protection cover**



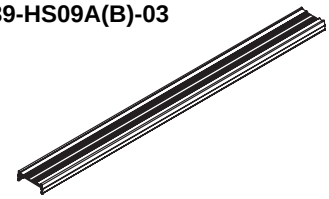

✻L is as follows.

| | |
|---|---|
| F39-HN□□□□-14<br>F39-HS□□□□A(B)-14 | L = □□□□ mm |
| F39-HN□□□□-25<br>F39-HS□□□□A(B)-25 | L = □□□□ – 22 mm |
| F39-HH09-03<br>F39-HS09A(B)-03 | L = 915 mm |

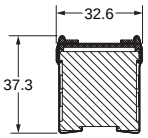
Materials: PC (transparent area)
ABS (non-transparent area)

## Spatter Protection Slit Covers

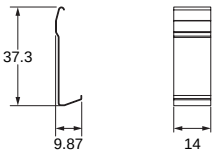
**F39-HS□□□□A(B)-14**
**F39-HS□□□□A(B)-25**
**F39-HS09A(B)-03**



**Mounting dimensions**




**Fixing bracket**

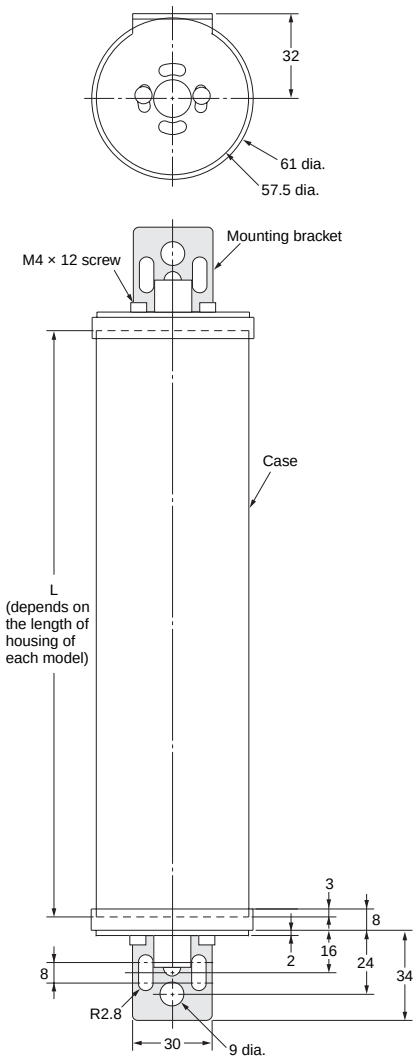



Materials: SUS

## Water-resistant Case

**F39-HP□□□□-14**
**F39-HP□□□□-25**
**F39-HPH09-03**

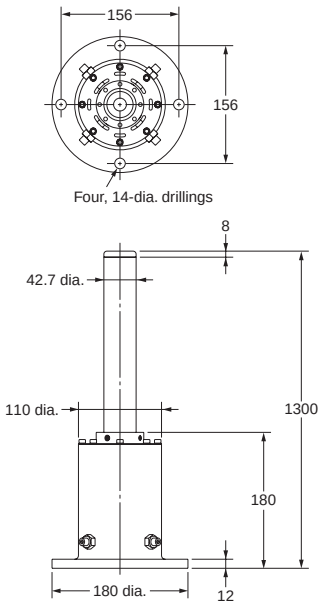





## Multi-beam Sensor Support Stand/Mirror Stand

**F39-ST1**

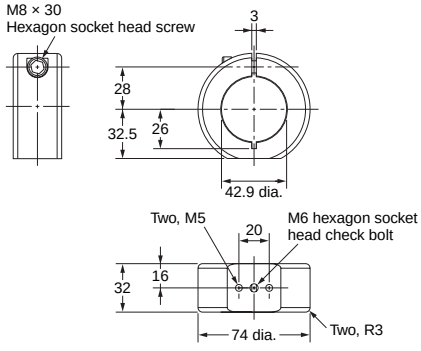





## Mounting Bracket

**F39-L22**

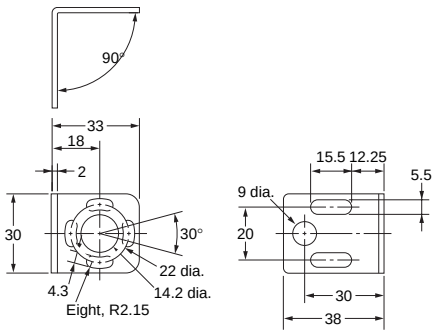




## Wall Mounting Bracket

**F39-L18**

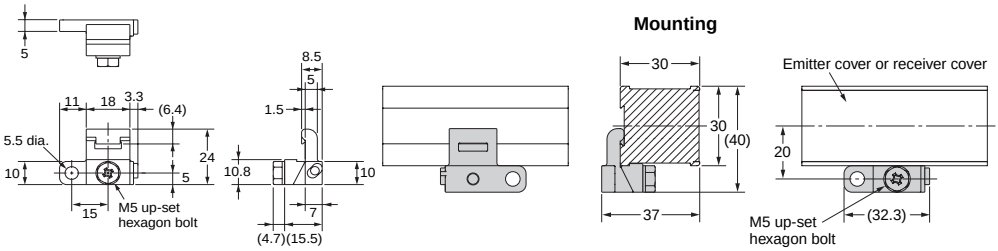





## Free-location Bracket

**F39-L19**

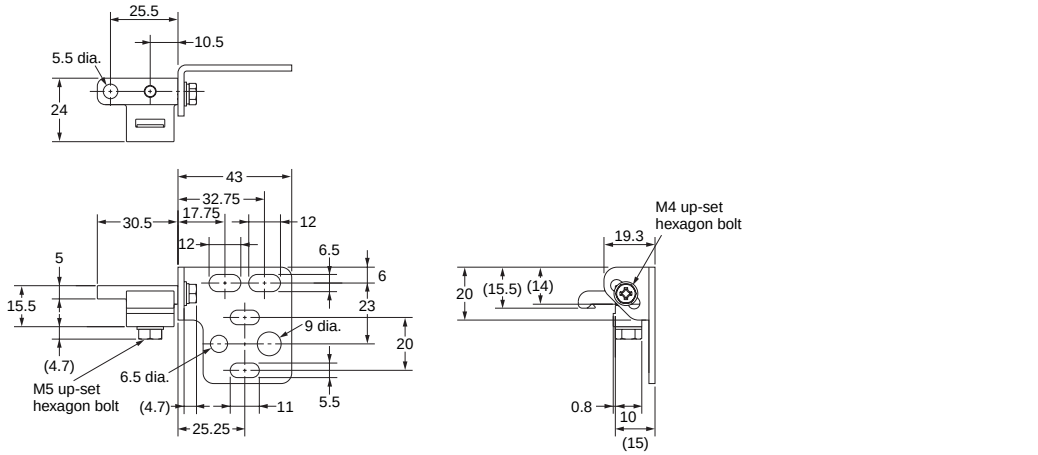





## Free-location Bracket

**F39-L20**

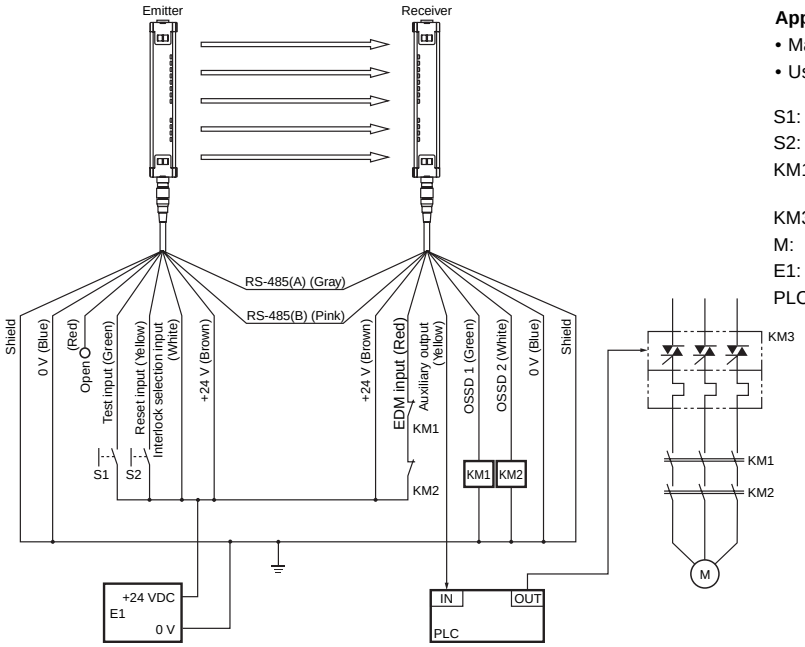




# Connection Circuit Examples

## An Example of Safety Circuits Where No Controller Is Used

### For Category 4 Rating (F3SN-A, F3SH-A)/Category 2 Rating (F3SN-B)

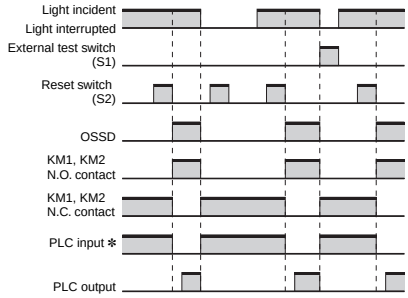



**Applicable operation mode**

- Manual reset mode
- Using the EDM function

S1: External test switch
S2: Interlock/lockout reset switch
KM1, KM2: Safety relay with forcibly guided contacts (G7SA) or magnetic contactor
KM3: Solid-state contactor (G3J)
M: 3-phase motor
E1: 24 VDC power supply (S82K)
PLC: Programmable controller
(Used for monitoring. This is not a part of a safety system.)

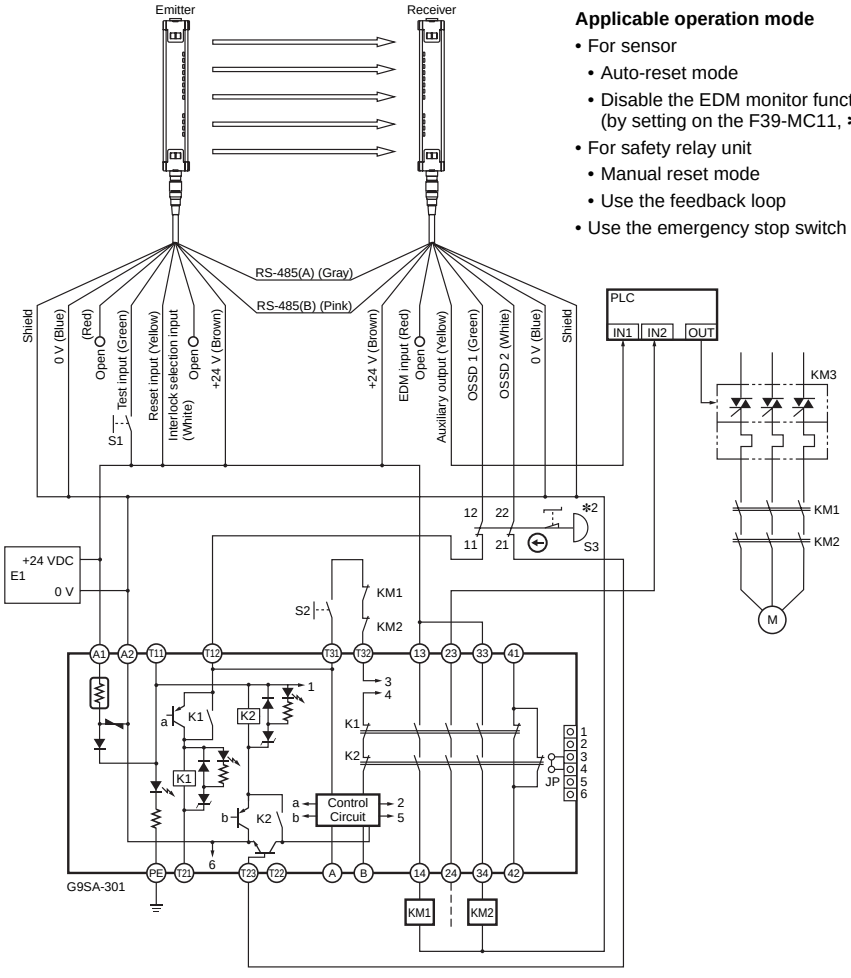
### Timing Chart




✻ The output operation mode of the auxiliary output is the Dark-ON output mode.

## An Example of Safety Circuits Where the G9SA-301 Safety Relay Unit is Connected

### For category 4 rating (F3SN-A, F3SH-A)/category 2 rating (F3SN-B)




**Applicable operation mode**

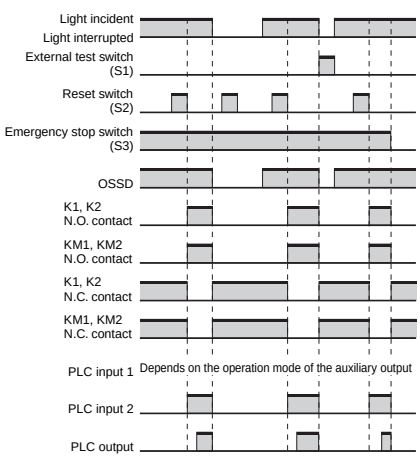
- For sensor
  - Auto-reset mode
  - Disable the EDM monitor function (by setting on the F39-MC11, ✻1.)
- For safety relay unit
  - Manual reset mode
  - Use the feedback loop
- Use the emergency stop switch ✻2

**✻1.** The F39-MC11 setting console cannot be connected to the F3SN-B. Therefore, short-circuit the auxiliary output terminal and the EDM input.

**✻2.** If emergency stop switch is not necessary, connect the OSSD 1 directly to T12 terminal and connect the OSSD 2 directly to T23 terminal.

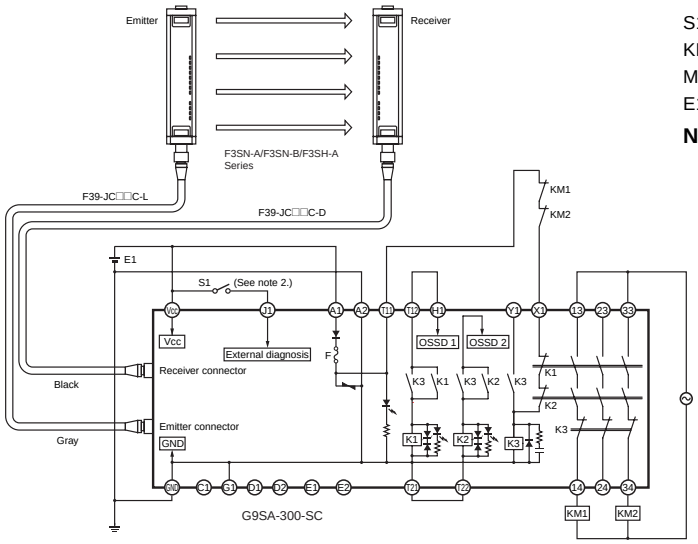
S1: External test switch
S2: Reset switch
S3: Emergency stop switch (direct opening contacts) (A165E or A22E)
KM1, KM2: Magnetic contactor
KM3: Solid-state contactor (G3J)
M: 3-phase motor
E1: 24 VDC power supply (S82K)
PLC: Programmable controller (Used for monitoring. This is not a part of a safety system.)

### Timing Chart



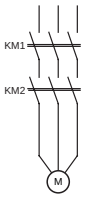
## Examples of Safety Circuits Where G9SA-300-SC Safety Relay Unit is Connected

### (1) For only safety light curtain in auto-reset mode
### For category 4 rating (F3SN-A, F3SH-A)/category 2 rating (F3SN-B)

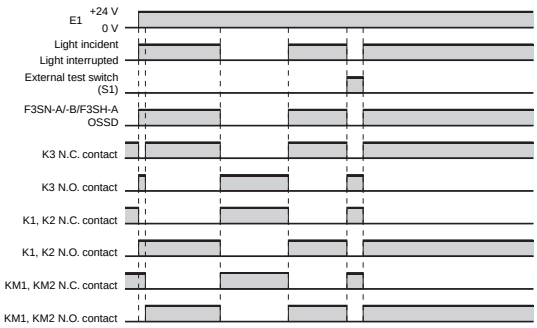



S1: External test switch
KM1, KM2: Magnetic contactor
M: 3-phase motor
E1: 24 VDC power supply (S82K)

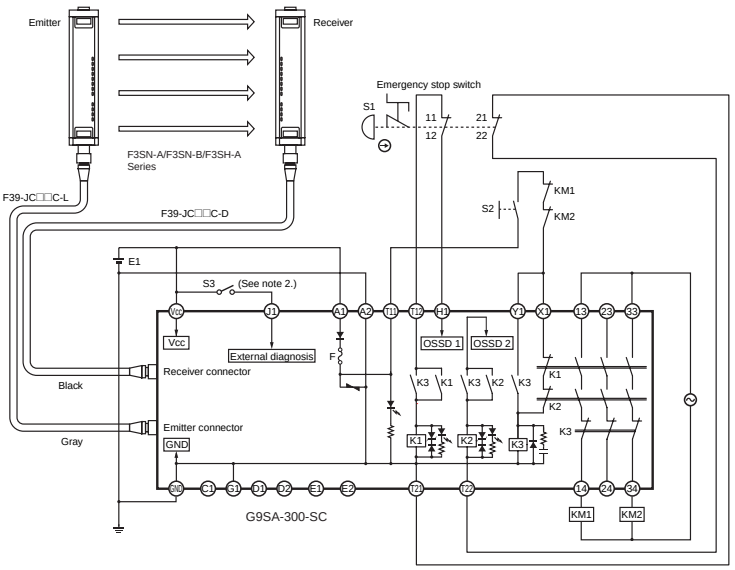
**Note: 1.** F3SN-A's EDM function and auxiliary output cannot be used.
**2.** Normal operation is performed when the switch S1 is released, and external diagnosis is performed when it is short-circuited.
**3.** Do not connect anything to the C1, D1, D2, E1, and E2 terminals.




#### Timing Chart

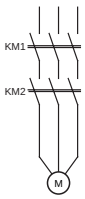



### (2) Safety light curtain connected with two channel emergency stop switch inputs in manual reset mode
### For category 4 rating (F3SN-A, F3SH-A)/category 2 rating (F3SN-B)

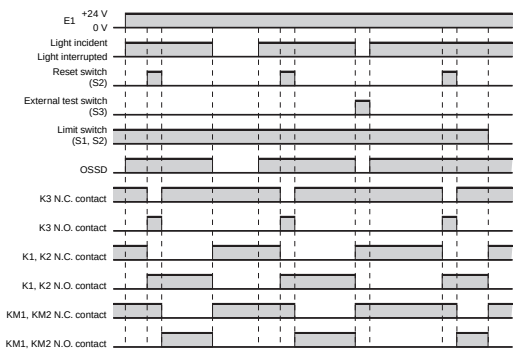



S1: Emergency stop switch ⊖
S2: Reset switch (momentary action switch)
S3: External test switch
KM1, KM2: Magnetic contactor
M: 3-phase motor
E1: 24 VDC power supply (S82K)

**Note: 1.** F3SN-A's EDM function and auxiliary output cannot be used.
**2.** Normal operation is performed when the switch S3 is released, and external diagnosis is performed when it is short-circuited.
**3.** Do not connect anything to the C1, D1, D2, E1, and E2 terminals.




#### Timing Chart



# Safety Precautions

This catalog is intended as a guide for product selection. Be sure to use the instruction manual provided with the product for actual operation.

## Regulations and Standards

### F3SN-A/F3SH-A

**1.** "Type Certification" specified in the Chapter 44. 2 of the Industrial Safety and Health Law in Japan does not apply to independent F3SN-A/F3SH-A Sensors. This law applies to systems incorporating the Sensor. When using the F3SN-A/F3SH-A Sensor in Japan as a "safety device for presses or shearing machines," as specified in the Chapter 42 of the same law, apply for certification for the overall system.

**2.** (1) The F3SN-A/F3SH-A is electro-sensitive protective equipment (ESPE) in accordance with European Union (EU) Machinery Directive Annex IV, B, Safety Components, Item 1.

(2) The F3SN-A/F3SH-A complies with the following regulations and standards:

1. EU Regulations
   - Machinery Directive: Directive 98/37/EC
   - EMC Directive: Directive 2004/108/EC
2. European standards: EN61496-1 (TYPE 4 ESPE), prEN61496-2 (TYPE 4 AOPD)
3. International standards: IEC61496-1 (TYPE 4 ESPE), IEC61496-2 (TYPE 4 AOPD)
4. American standards: UL61496-1 (TYPE 4 ESPE), UL61496-2 (TYPE 4 AOPD), UL508, UL1998, CAN/CSA22.2 No. 14, CAN/CSA22.2 No. 0.8
5. JIS standards: JIS B9704-1 (TYPE 4 ESPE), JIS B9704-2 (TYPE 4 AOPD)

(3) The F3SN-A/F3SH-A received the following certification from the EU accredited body DEMKO A/S:
- EC Type-Examination in accordance with the EU Machinery Directive (TYPE 4 ESPE)
- DEMKO Type Certification
  Type 4 ESPE (EN61496-1)
  Type 4 AOPD (prEN61496-2)

(4) The F3SN-A/F3SH-A received the following certification from the Third Party Assessment Body UL:
- Certificate of UL listing for US and Canadian safety standards
  Both of which are: TYPE 4 ESPE (UL61496-1), TYPE 4 AOPD (UL61496-2)

(5) The F3SN-A/F3SH-A received the following certification from BG-PRUFZERT of Germany:
- BG test and certification mark
  License
  Type 4 ESPE (EN61496-1)
  Type 4 AOPD (prEN61496-2)

**3.** The F3SN-A/F3SH-A is designed according to the following standards. To make sure that the F3SN-A/F3SH-A complies with the following standards and regulations, you are asked to design and use it as provided by any other related standards, laws, and regulations. (Underlined regulations are applicable to the F3SN-A only.)
Consult UL or other standardization bodies if you have any questions.
- EN415-4, prEN691, EN692, prEN693 (European standards)
- OSHA 29 CFR 1910.212 (US Industrial Safety and Health Regulation)
- OSHA 29 CFR 1910.217 (US Industrial Safety and Health Regulation)
- ANSI B11.1 - B11.19 (US standard)
- ANSI/RIA 15.06 (US standard)
- Guideline Concerning Failsafe Methods for Control Mechanisms in Machine Tools, 28 July 1998 (The Announcement No. 464, Ministry of Health, Labour and Welfare)

### F3SN-B

**1.** "Type Certification" specified in the Chapter 44. 2 of the Industrial Safety and Health Law in Japan does not apply to independent units of the F3SN-B sensor. This law applies to systems incorporated with the sensors.
When using the F3SN-B sensor in Japan as a "safety device for presses or shearing machines" as specified in the Chapter 42 of the same law, apply for certification as a system.

**2.** (1) The F3SN-B is electro-sensitive protective equipment (ESPE) in accordance with European Union (EU) Machinery Directive Annex IV, B, Safety Components, Item 1.

(2) The F3SN-B complies with the following regulations and standards:

1. EU Regulations
   - Machinery Directive: Directive 98/37/EC
   - EMC Directive: Directive 2004/108/EC
2. European standards: EN61496-1 (TYPE 2 ESPE), prEN61496-2 (TYPE 2 AOPD)
3. International standards: IEC61496-1 (TYPE 2 ESPE), IEC61496-2 (TYPE 2 AOPD)
4. American standards: UL61496-1 (TYPE 2 ESPE), UL61496-2 (TYPE 2 AOPD), UL508, UL1998, CAN/CSA22.2 No. 14, CAN/CSA22.2 No. 0.8
5. JIS standards: JIS B9704-1 (TYPE 2 ESPE), JIS B9704-2 (TYPE 2 AOPD)

(3) The F3SN-B received the following certification from the EU accredited body DEMKO A/S:
- EC Type-Examination in accordance with the EU Machinery Directive (TYPE 2 ESPE)
- DEMKO Type Certification
  Type 2 ESPE (EN61496-1)
  Type 2 AOPD (prEN61496-2)
  Use: EN954-1 Category B, 1, 2

(4) The F3SN-B received the following certification from the Third Party Assessment Body UL:
- Certificate of UL listing for US and Canadian safety standards
  Both of which are: Type 2 ESPE (UL61496-1), Type 2 AOPD (UL61496-2)

(5) The F3SN-B received the following certification from BG-PRUFZERT of Germany:
- BG test and certification mark
  License
  Type 2 ESPE (EN61496-1)
  Type 2 AOPD (prEN61496-2)

**3.** The F3SN-B is designed according to the following standards. To make sure that the F3SN-B complies with the following standards and regulations, you are asked to design and use it as provided by any other related standards, laws, and regulations.
Consult UL or other standardization bodies if you have any questions.
- EN415-4 (European standard)
- OSHA 29 CFR 1910.212 (US Industrial Safety and Health Regulation)
- ANSI/RIA 15.06 (US standard)
- Guideline Concerning Failsafe Methods for Control Mechanisms in Machine Tools, 28 September 1998 (The Announcement No. 464, Ministry of Health, Labour and Welfare)

**⚠ WARNING**

## Detection Zone and Intrusion Path

Refer to "*Precautions for All Safety Sensors*" on page 242 for the installation conditions of Safety Light Curtains.

## F3SH-A Multi-beam Safety Sensor

Install protective structures around the machine so that you must pass through the detection zone of the F3SH-A to reach a hazardous part of the machine.
If it is possible for an operator to get between the sensor's detection zone and the hazardous part of the machine, design the system so that machinery cannot start up automatically. Make sure that machinery cannot restart while the operator is in the hazardous area. Position the switch for restarting machinery in a location from which the status of the hazardous area can be seen clearly. The switch position location must be a place where the switch cannot be operated from within the hazardous area.
Failure to do so may result in serious injury.



## Use of the Fixed Blanking Function (F3SN-A only)

After setting the fixed blanking, check that the F3SN-A detects a test rod at any position in the detection zone through which a person can reach the hazardous part of the machine. If any positions are found by check above, install protective structures to prevent intrusion, which the F3SN-A can not detect.
Failure to do so may result in serious injury.



## Safety Distance

Always maintain a safe distance (S) between the light curtain and a hazardous part of a machine.
Failure to do so causes the machine to fail to stop before an operator reaches the dangerous area and may result in serious injury.



Use of the floating blanking increases the size of the detection capability. To calculate a safety distance, be sure to use the increased size of the detection capability.
Failure to do so causes the machine to fail to stop before an operator reaches the dangerous area and may result in serious injury.



Refer to the "*Precautions for All Safety Sensors*" on page 242 for calculating the Safety distance.

### Response Time Table

| Model | Protective height (mm) | Number of beams | Response time | |
|---|---|---|---|---|
| | | | ON to OFF | OFF to ON |
| **F3SNA□□□□ P14(-01)** | 180 to 450 | 20 to 50 | 10.0 | 40 |
| | 459 to 765 | 51 to 85 | 12.5 | 50 |
| | 774 to 1,080 | 86 to 120 | 15.0 | 60 |
| | 1,089 to 1,125 | 121 to 125 | 15.5 | 62 |

| Model | Protective height (mm) | Number of beams | Response time | |
|---|---|---|---|---|
| | | | ON to OFF | OFF to ON |
| **F3SN-A□□□□ P25(-01) F3SN-B□□□□ P25** | 217 to 772 | 13 to 50 | 10.0 | 40 |
| | 787 to 1,297 | 51 to 85 | 12.5 | 50 |
| | 1,312 to 1,822 | 86 to 120 | 15.0 | 60 |

| Model | Protective height (mm) | Number of beams | Response time | |
|---|---|---|---|---|
| | | | ON to OFF | OFF to ON |
| **F3SN-A□□□□ P40(-01) F3SN-B□□□□ P40** | 217 to 757 | 7 to 25 | 10.0 | 40 |
| | 787 to 1,297 | 26 to 43 | 12.5 | 50 |
| | 1,327 to 1,807 | 44 to 60 | 15.0 | 60 |

| Model | Protective height (mm) | Number of beams | Response time | |
|---|---|---|---|---|
| | | | ON to OFF | OFF to ON |
| **F3SN-A□□□□ P70(-01) F3SN-B□□□□ P70** | 277 to 757 | 5 to 13 | 10.0 | 40 |
| | 817 to 1,297 | 14 to 22 | 12.5 | 50 |
| | 1,357 to 1,777 | 23 to 30 | 15.0 | 60 |

- Response time for series connected types is calculated as follows:
  (F3SN-A)
  For 2 sets:
  Response time (ON to OFF): Response time of Light curtain 1 + Response time of Light curtain 2 + 3 ms
  Response time (OFF to ON): Response time of Light curtain 1 + Response time of Light curtain 2 + 12 ms
  For 3 sets:
  Response time (ON to OFF): Response time of Light curtain 1 + Response time of Light curtain 2 + Response time of Light curtain 3 + 4 ms
  Response time (OFF to ON): Response time of Light curtain 1 + Response time of Light curtain 2 + Response time of Light curtain 3 + 16 ms
- Response time of F3SP-B1P is 10 ms, operation time is 100 ms.

**Note:** When using the F3SP-B1P, determine the safety distance by adding the response time of the F3SP-B1P to that of the F3SN given in the table above.

## Precautions for Correct Use

Do not use the product in atmospheres or environments that exceed product ratings.

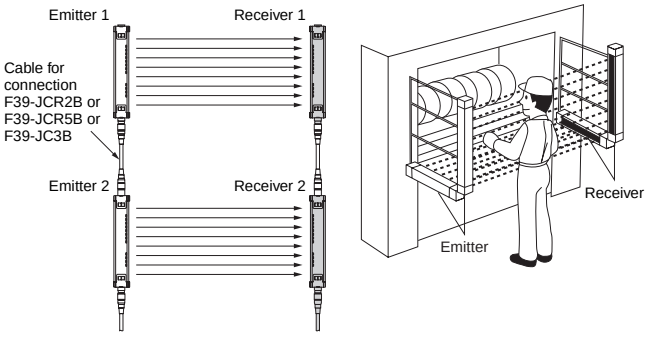
## Installation

### How to Prevent Mutual Interference

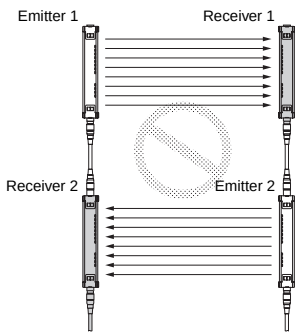
**Series connection (Up to 3 sets, 240 beams, sensor models ending in -01, -03, -04, and -05 are required for series connection)**

Two or more pairs of the F3SN-A can be connected in series. When connected in series, the F3SN-A sensors generate beams in a time-sharing manner. Thus, they prevent mutual interference and ensure safety.

**Correct**

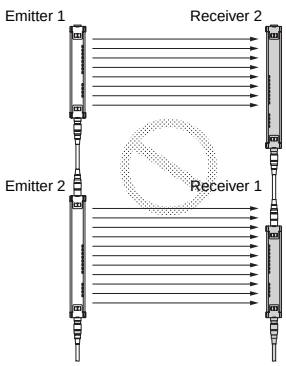



**Incorrect**




Do not connect the emitter and receiver in series, or a lockout condition will result.

**Incorrect**




Do not combine an emitter with a receiver of a different pair. This will cause a lockout condition and detection of objects will be disabled.

### When not connected

Refer to "*Precautions for All Safety Sensors*" on page 242 for information on preventing mutual interference of Safety Light Curtains that are not connected in series.

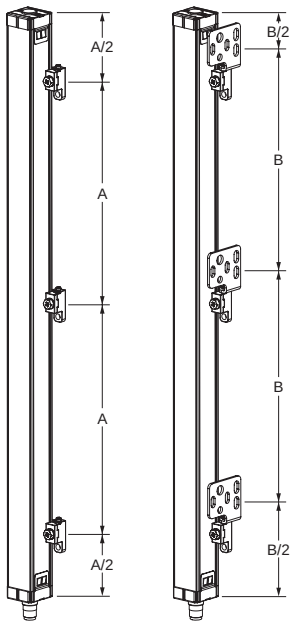
## Installation

### How to attach Mounting Bracket (F39-L19/L20)

To fully utilize the performance of sensors, locate the F39-L19/L20 mounting brackets in the number satisfying the dimensions "A" and "B" in the sensor longitudinal direction.

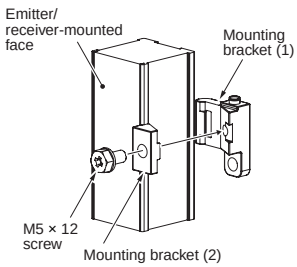
- For the F39-L19
  Spacing "A": 670 mm max.
- For the F39-L20
  Spacing "B": 400 mm max.

**Note:** When installing sensors at locations susceptible to vibration and shock, increase the number of mounting brackets.




| Mounting bracket | Screw × length (mm) | Tightening torque |
|---|---|---|
| **F39-L19** | M5 × 12 screw | 2.0 N·m |
| **F39-L20** | M4 × 8 screw | 1.2 N·m |

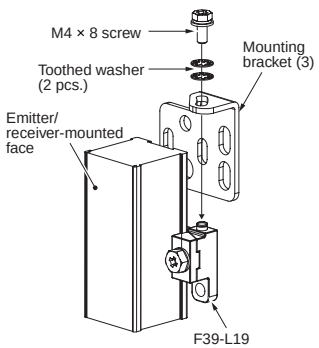
**F39-L19**




**Brackets and screws included in one set**

- Mounting bracket (1) .....1
- Mounting bracket (2) .....1
- M5 × 12 screw .....1

**F39-L20**




**Brackets and screws included in one set**

- Mounting bracket (1) .....1
- Mounting bracket (2) .....1
- M5 × 12 screw .....1
- Mounting bracket (3) .....1
- M4 × 8 screw .....1
- Toothed washer .....2

## Safety-related Functions

### Interlock Function

The auto-reset mode and the manual reset mode are wire selectable features of the F3SN-A/F3SN-B/F3SH-A.

### Auto-reset Mode

After the power is turned ON and none of the beams are interrupted, the OSSD (Output Signal Switching Device) outputs will go to their ON-state.

### Manual Reset Mode

For the factory setting, the start/restart interlock is selected in the manual reset mode. When the light curtain enters the interlock condition, it keeps the OSSD outputs in the OFF-state. Even if all beams become free, the OSSD outputs will not go to the ON-state. When none of the beams are interrupted in the detection zone, applying the reset input resets the interlock condition and the OSSD outputs go to the ON-state.

- Start/restart interlock
  After the power is turned ON, or when at least one beam is interrupted, the light curtain enters the interlock condition.
- Start interlock
  Only after power ON, the light curtain enters the interlock condition.
- Restart interlock
  Only when at least one beam is interrupted, the light curtain enters the interlock condition.

### Fixed Blanking Function (F3SN-A only)

This function is set with the F39-MC11 setting console.
This is a function provided to disable a specific area of the light curtain's detection zone. Fixed blanking can be set for any desired number of beams. If an object enters the disabled detection zone, the OSSD outputs status will not change. This function is used when there is a stationary object in the detection zone that needs to be ignored.

### Floating Blanking Function (F3SN-A only)

This function is set with the F39-MC11 setting console.
During normal operation when floating blanking is disabled, and at least one beam is interrupted, the light curtain will go to the OFF-state. However, using this function prevents the light curtain from going to the OFF-state until multiple beams (✻1, ✻2, and ✻3) are interrupted.

**✻1.** The number of the floating blanking beams can be selected in the range of 1 to 3 beams.
**✻2.** This function can be set to be active only if the interrupted beams are adjacent to each other.
**✻3.** This function can be set so that the top and bottom beams cannot be set for the function.

## Diagnostic Functions

### Self-test

After power ON, the F3SN-A/F3SN-B/F3SH-A performs a complete self-test within 1 second. In addition, it performs a self-test (within response time) periodically during operation.

### External Test

This function stops the emission of light from the light curtain using an external signal and checks that the light curtain operates properly.

### Lockout Condition

If an error is detected by the self-test, the light curtain enters the lockout condition, keeps the OSSD outputs in their OFF state and displays the error mode. Lockout condition can be cleared either by resetting the power or by changing the setting of the reset switch from closed to open (open to closed for auto-reset). (With some errors, the lockout condition is automatically reset when the light curtain confirms that the cause of the error has been removed.)

### EDM (External Device Monitoring)

This function monitors the state of the NC contacts. Connect the NC contact of the MPCEs to the EDM input line of the receiver. If the correct logical relationship between the OSSD outputs and the EDM input is not kept, the light curtain immediately enters the lockout condition and the OSSD outputs will go to their OFF-state.
The light curtain's normal operation is up to 300 ms max. (✻), this allows for the delay time caused by the release of the MPCEs.
To ensure the correct usage of this function, the MPCEs must be safety-certified types with forcibly guided contacts.

### When the EDM is not used

In the case the EDM input is not used, connect the auxiliary output in the Dark-ON output mode to the EDM input line, or disable the EDM with the F39-MC11 setting console.

✻ The value can be changed by the F39-MC11.
(It is impossible to connect the F39-MC11 to the F3SN-B.)

## Non-safety Output

### Auxiliary Output

The default of this output is the reverse signal of the safety outputs (Dark-ON output). This output can be used for monitoring purposes by connecting it to a device such as a PLC.
The auxiliary output can be selected to give one of the following output operation modes by the F39-MC11. (F39-MC11 cannot be connected to the F3SN-B.)

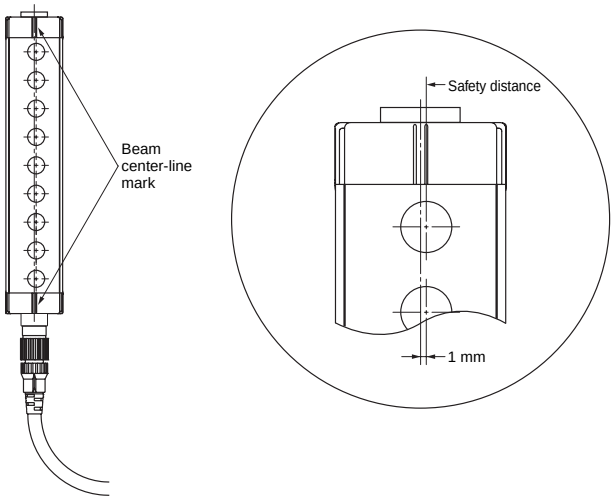
- Dark-ON output mode (fixed for the F3SN-B)
- Light-ON output mode
- Light diagnosis mode
- Lockout mode
- Outermost-beam monitoring mode
- Specified-beam mode
- Blanking monitoring mode (F3SN-A only)

### External Indicator Output (Series-connection type only)

This output can be connected to an external indicator to display one of the operation modes as selected by the F39-MC11. The default of this output is Light-ON output. A desired output operation mode can be selected by using the F39-MC11. (F39-MC11 cannot be connected to the F3SN-B.)

## Beam Center-line

The beam center-line is the line going through all of the beams. (See diagram below.) This position is a reference line for measuring safety distance. Use the line closer to the hazardous area as a reference line for the safety distance.



# F3SN-A□SS

## Greater resistance to external light interference. Significantly less interference with other sensors.



- Interference reduced both between Sensors of the same type and Sensors of different types.
- Setting Console Optimizes Light Sensitivity for Specific Ranges
- Ideal Where Installation Space Is Limited
- Conforms to International Safety Standards
- Korean standard “S-mark” models are also available.

⚠ Be sure to read the *“Safety Precautions”* on page 431 and the *“Precautions for All Safety Sensors”* on page 242.



## Features

### New Emitter Mechanism Eliminates Excessive Light

**Removing excessive light is the key to eliminating mutual interference, external light interference, and other similar causes of unwanted line stoppages.**

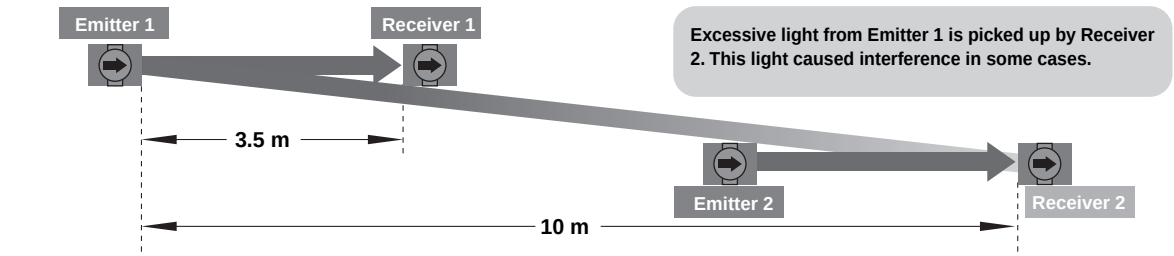
#### Conventional Models

Conventional models had an operating range that was too long. This meant that they picked up light from sensors in unexpected locations and they interfered with other sensors.

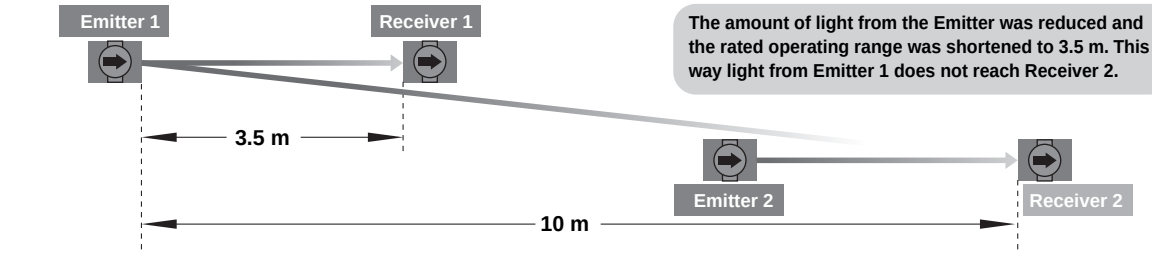
#### F3SN-A□SS Series

The operating range for the F3SN-A□SS Series is limited to 3.5 m as opposed to 10 m for conventional models. This dramatically reduces the negative impact on adjacent light curtains and surrounding photoelectric sensors even in applications where parallel light curtains are installed for multiple devices. It also eliminates additional work such as installing special wiring to prevent interference.

**Conventional F3SN-A Series**

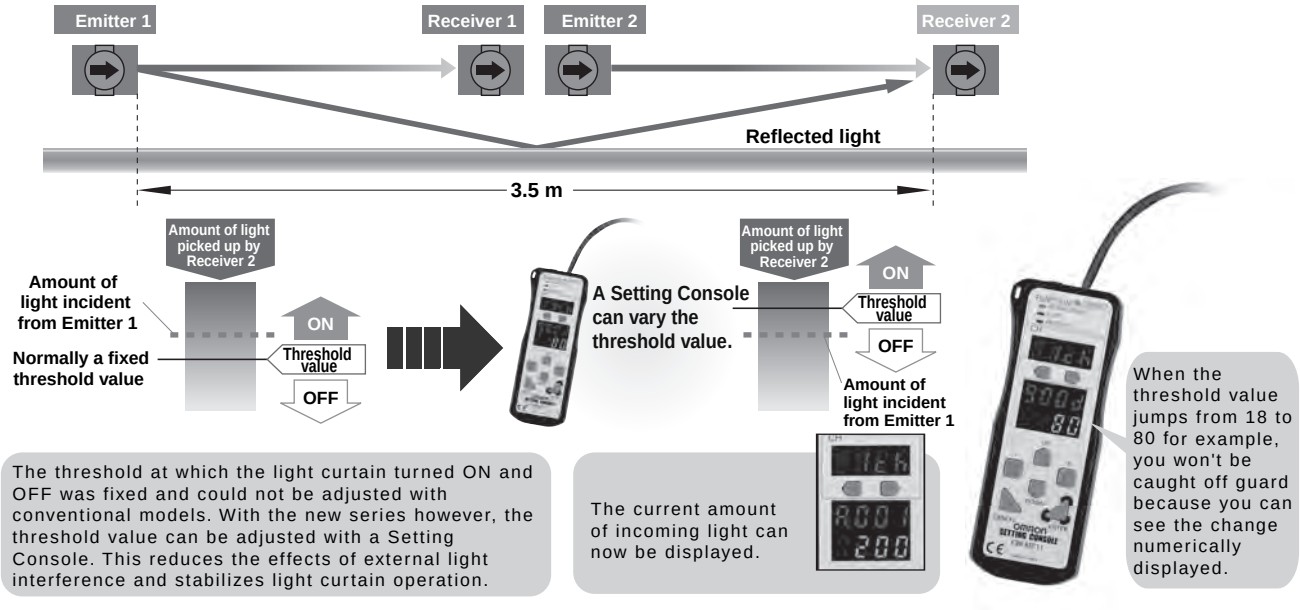



**F3SN-A□SS Series**



## Setting Console Optimizes Light Sensitivity for Specific Ranges

### Even Light Reflected from Walls



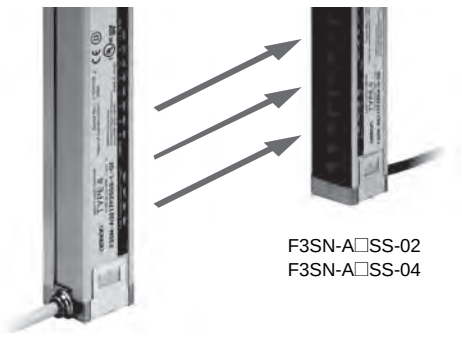

The threshold at which the light curtain turned ON and OFF was fixed and could not be adjusted with conventional models. With the new series however, the threshold value can be adjusted with a Setting Console. This reduces the effects of external light interference and stabilizes light curtain operation.

The current amount of incoming light can now be displayed.

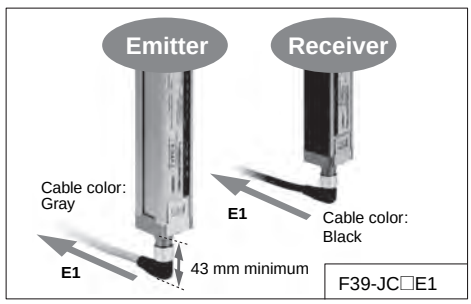
## Ideal Where Installation Space Is Limited

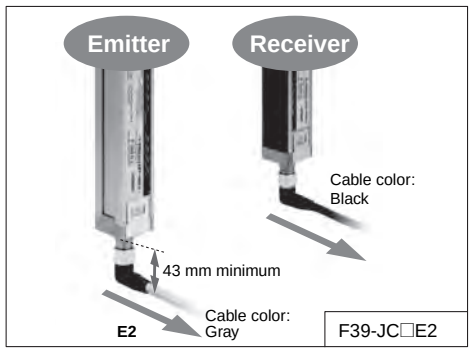
### Back-mounted Connector Cable Models and Optional Right-angle Cables

Models with connector cables attached at the back (F3SN-A□SS-02/04) can be used for installation where space is limited and there is no extra room at the bottom of the Light Curtains. The F3SN-A□SS-04 also equipped with a connector cable at the top for series connection. When there is no space at the back, traditional Straight Connector Cables or an optional L-shaped Connector Cable (F39-JC□E□) that extends from the side of the lens surface are also available.



F3SN-A□SS-02
F3SN-A□SS-04




Note: The direction of the cable is fixed.

**More Compact Machines**
The F3SN-A□P14 finger protection model is ideal for the more compact machines available today. It has a safe distance that can be as short as 88 mm.
Refer to **F3SN-A/ F3SN-B**, **F3SH-A** on page 378 for details.

## Conforms to International Safety Standards

The F3SN-A□SS is a Type 4 sensor with a category 4 rating. This means that it conforms to the highest standards of safety for a Safety Light Curtain. The F3SN-A□SS conforms to all the following standards.

| | |
|---|---|
| **International standard** | IEC61496-1, IEC61496-2 |
| **EU regulations, EN standard** | Machinery Directive, EMC Directive, EN61496-1, EN61496-2 |
| **JIS standards** | JIS B9704-1, B9704-2 |
| **North American Standards** | UL61496-1, UL61496-2, UL508, UL1998, CAN/CSA22.2 No.14, CAN/CSA22.2 No.0.8 |
| **Korean Standard** | S-mark certification (only -S Models) |

Application is also possible in devices covered by the OSHA standards (29 CFR 1910.212) of the USA. The requirements of the USA Industrial Robot Standard ANSI/RIA R15.06-1999 have also been satisfied.

CE c UL us IEC OSHA ANSI/RIA JIS

# Ordering Information

## Main Unit

### F3SN-A□SS Safety Light Curtains (Type 4)

A Connector Cable is not supplied with the Main Unit, and must be purchased separately.

| Connection method | | | Min. detectable object | Beam gap | Appearance | Operating range | Protective height (mm) | Number of beams | Model |
|---|---|---|---|---|---|---|---|---|---|
| Sensor bottom | Sensor top | Application | | | | | | | |
| M12 straight connector | No connector | • Standalone<br>• Last set in a series connection (second of 2 sets connected in series or third of 3 sets connected in series) | 25 dia. | 15 mm |  | 0.2 to 3.5 m | 217 | 13 | **F3SN-A0217P25SS** |
| | | | | | | | 262 | 16 | **F3SN-A0262P25SS** |
| | | | | | | | 352 | 22 | **F3SN-A0352P25SS** |
| | | | | | | | 427 | 27 | **F3SN-A0427P25SS** |
| | | | | | | | 502 | 32 | **F3SN-A0502P25SS** |
| | | | | | | | 592 | 38 | **F3SN-A0592P25SS** |
| | | | | | | | 667 | 43 | **F3SN-A0667P25SS** |
| | | | | | | | 742 | 48 | **F3SN-A0742P25SS** |
| | | | | | | | 832 | 54 | **F3SN-A0832P25SS** |
| | | | | | | | 907 | 59 | **F3SN-A0907P25SS** |
| | | | | | | | 982 | 64 | **F3SN-A0982P25SS** |
| | | | | | | | 1072 | 70 | **F3SN-A1072P25SS** |
| | | | | | | | 1147 | 75 | **F3SN-A1147P25SS** |
| | | | | | | | 1222 | 80 | **F3SN-A1222P25SS** |
| | | | | | | | 1312 | 86 | **F3SN-A1312P25SS** |
| | | | | | | | 1462 | 96 | **F3SN-A1462P25SS** |
| | | | | | | | 1627 | 107 | **F3SN-A1627P25SS** |
| | | | | | | | 1792 | 118 | **F3SN-A1792P25SS** |
| | M12 straight Connector | • Not the last set in a series connection (first of 2 sets connected in series, or first or second of 3 sets connected in series)<br>• For external indicator installations | | |  | | 217 | 13 | **F3SN-A0217P25SS-01** |
| | | | | | | | 262 | 16 | **F3SN-A0262P25SS-01** |
| | | | | | | | 352 | 22 | **F3SN-A0352P25SS-01** |
| | | | | | | | 427 | 27 | **F3SN-A0427P25SS-01** |
| | | | | | | | 502 | 32 | **F3SN-A0502P25SS-01** |
| | | | | | | | 592 | 38 | **F3SN-A0592P25SS-01** |
| | | | | | | | 667 | 43 | **F3SN-A0667P25SS-01** |
| | | | | | | | 742 | 48 | **F3SN-A0742P25SS-01** |
| | | | | | | | 832 | 54 | **F3SN-A0832P25SS-01** |
| | | | | | | | 907 | 59 | **F3SN-A0907P25SS-01** |
| | | | | | | | 982 | 64 | **F3SN-A0982P25SS-01** |
| | | | | | | | 1072 | 70 | **F3SN-A1072P25SS-01** |
| | | | | | | | 1147 | 75 | **F3SN-A1147P25SS-01** |
| | | | | | | | 1222 | 80 | **F3SN-A1222P25SS-01** |
| | | | | | | | 1312 | 86 | **F3SN-A1312P25SS-01** |
| | | | | | | | 1462 | 96 | **F3SN-A1462P25SS-01** |
| | | | | | | | 1627 | 107 | **F3SN-A1627P25SS-01** |
| | | | | | | | 1792 | 118 | **F3SN-A1792P25SS-01** |
| Back connector with 0.4 m cable | No connector | • Standalone<br>• When dimensions at the bottom of the Sensor are restricted<br>• Last set in a series connection (second of 2 sets connected in series or third of 3 sets connected in series) | | |  | | 217 | 13 | **F3SN-A0217P25SS-02** |
| | | | | | | | 262 | 16 | **F3SN-A0262P25SS-02** |
| | | | | | | | 352 | 22 | **F3SN-A0352P25SS-02** |
| | | | | | | | 427 | 27 | **F3SN-A0427P25SS-02** |
| | | | | | | | 502 | 32 | **F3SN-A0502P25SS-02** |
| | | | | | | | 592 | 38 | **F3SN-A0592P25SS-02** |
| | | | | | | | 667 | 43 | **F3SN-A0667P25SS-02** |
| | | | | | | | 742 | 48 | **F3SN-A0742P25SS-02** |
| | | | | | | | 832 | 54 | **F3SN-A0832P25SS-02** |
| | | | | | | | 907 | 59 | **F3SN-A0907P25SS-02** |
| | | | | | | | 982 | 64 | **F3SN-A0982P25SS-02** |
| | | | | | | | 1072 | 70 | **F3SN-A1072P25SS-02** |
| | | | | | | | 1147 | 75 | **F3SN-A1147P25SS-02** |
| | | | | | | | 1222 | 80 | **F3SN-A1222P25SS-02** |
| | | | | | | | 1312 | 86 | **F3SN-A1312P25SS-02** |
| | | | | | | | 1462 | 96 | **F3SN-A1462P25SS-02** |
| | | | | | | | 1627 | 107 | **F3SN-A1627P25SS-02** |
| | | | | | | | 1792 | 118 | **F3SN-A1792P25SS-02** |

| Connection method | | | Min. detectable object | Beam gap | Appearance | Operating range | Protective height (mm) | Number of beams | Model |
|---|---|---|---|---|---|---|---|---|---|
| Sensor bottom | Sensor top | Application | | | | | | | |
| Back connector with 0.4 m cable | Back connector with 0.2 m cable | • Not the last set in a series connection (first of 2 sets connected in series, or first or second of 3 sets connected in series) | 25 dia. | 15 mm |  | 0.2 to 3.5 m | 217 | 13 | **F3SN-A0217P25SS-04** |
| | | | | | | | 262 | 16 | **F3SN-A0262P25SS-04** |
| | | | | | | | 352 | 22 | **F3SN-A0352P25SS-04** |
| | | | | | | | 427 | 27 | **F3SN-A0427P25SS-04** |
| | | | | | | | 502 | 32 | **F3SN-A0502P25SS-04** |
| | | | | | | | 592 | 38 | **F3SN-A0592P25SS-04** |
| | | | | | | | 667 | 43 | **F3SN-A0667P25SS-04** |
| | | | | | | | 742 | 48 | **F3SN-A0742P25SS-04** |
| | | | | | | | 832 | 54 | **F3SN-A0832P25SS-04** |
| | | | | | | | 907 | 59 | **F3SN-A0907P25SS-04** |
| | | | | | | | 982 | 64 | **F3SN-A0982P25SS-04** |
| | | | | | | | 1072 | 70 | **F3SN-A1072P25SS-04** |
| | | | | | | | 1147 | 75 | **F3SN-A1147P25SS-04** |
| | | | | | | | 1222 | 80 | **F3SN-A1222P25SS-04** |
| | | | | | | | 1312 | 86 | **F3SN-A1312P25SS-04** |
| | | | | | | | 1462 | 96 | **F3SN-A1462P25SS-04** |
| | | | | | | | 1627 | 107 | **F3SN-A1627P25SS-04** |
| | | | | | | | 1792 | 118 | **F3SN-A1792P25SS-04** |

## F3SN-A□SS-S S-Mark Type 4 Safety Light Curtain

A Connector Cable is not supplied with the Main Unit, and must be purchased separately.

| Connection method | | | Min. detectable object | Beam gap | Appearance | Operating range | Protective height (mm) | Number of beams | Model |
|---|---|---|---|---|---|---|---|---|---|
| Sensor bottom | Sensor top | Application | | | | | | | |
| M12 straight connector | No connector | • Standalone | 25 dia. | 15 mm |  | 0.2 to 3.5 m | 217 | 13 | **F3SN-A0217P25SS-S** |
| | | | | | | | 262 | 16 | **F3SN-A0262P25SS-S** |
| | | | | | | | 352 | 22 | **F3SN-A0352P25SS-S** |
| | | | | | | | 427 | 27 | **F3SN-A0427P25SS-S** |
| | | | | | | | 502 | 32 | **F3SN-A0502P25SS-S** |
| | | | | | | | 592 | 38 | **F3SN-A0592P25SS-S** |
| | | | | | | | 667 | 43 | **F3SN-A0667P25SS-S** |
| | | | | | | | 742 | 48 | **F3SN-A0742P25SS-S** |
| | | | | | | | 832 | 54 | **F3SN-A0832P25SS-S** |
| | | | | | | | 907 | 59 | **F3SN-A0907P25SS-S** |
| | | | | | | | 982 | 64 | **F3SN-A0982P25SS-S** |
| | | | | | | | 1072 | 70 | **F3SN-A1072P25SS-S** |
| | | | | | | | 1147 | 75 | **F3SN-A1147P25SS-S** |
| | | | | | | | 1222 | 80 | **F3SN-A1222P25SS-S** |
| | | | | | | | 1312 | 86 | **F3SN-A1312P25SS-S** |
| | | | | | | | 1462 | 96 | **F3SN-A1462P25SS-S** |
| | | | | | | | 1627 | 107 | **F3SN-A1627P25SS-S** |
| | | | | | | | 1792 | 118 | **F3SN-A1792P25SS-S** |

**Note: 1.** A Connector Cable is not supplied with the Main Unit, and must be purchased separately. The overall length of the cable connecting a Safety Light Curtain to the DC power supply must not exceed 10 m.

**2.** Two ferrite cores are provided with Safety Light Curtains that are S-Mark compliant. Attach one ferrite core to the emitter cable and the other to the receiver cable when connecting the Light Curtain with the optional Connector Cable.

**3.** Japanese-, English-, and Korean-language operation manuals are available on the CD-ROM provided with the S-Mark Safety Light Curtain.

## Accessories (Sold Separately)

### Cable with Connector on One End (For Emitter and Receiver, 1 Set of 2 Cables)

For Connection with Safety Devices such as Relays with Forcibly Guided Contacts, Safety Relay Units, and Safety Controllers

| Type | Appearance | Cable length | Specification | Model |
|---|---|---|---|---|
| Straight Connectors |  | 0.5 m | M12 straight connectors (8-pin) | **F39-JCR5A** |
| | | 3 m | | **F39-JC3A** |
| | | 7 m | | **F39-JC7A** |
| | | 10 m | | **F39-JC10A** |
| | | 15 m | | **F39-JC15A** |
| Right-angle Connectors, Emitter Cable to Right and Receiver Cable to Left |  | 3 m | M12 right-angle connectors (8-pin) Cables go to the back when the Emitter is mounted on the left side and the Receiver is mounted on the right side. | **F39-JC3E1** |
| | | 7 m | | **F39-JC7E1** |
| | | 10 m | | **F39-JC10E1** |
| | | 15 m | | **F39-JC15E1** |
| Right-angle Connectors, Emitter Cable to Left and Receiver Cable to Right |  | 3 m | M12 right-angle connectors (8-pin) Cables go to the front when the Emitter is mounted on the left side and the Receiver is mounted on the right side. | **F39-JC3E2** |
| | | 7 m | | **F39-JC7E2** |
| | | 10 m | | **F39-JC10E2** |
| | | 15 m | | **F39-JC15E2** |

## Cable with Connectors on Both Ends (For Emitter and Receiver, 1 Set of 2 Cables)

For Series Connection or Connection with the F3SP-B1P Safety Relay Unit

| Appearance | Cable length | Specification | Application | Model |
|---|---|---|---|---|
|  | 0.2 m | M12 Straight Connectors (8-pin) | Series connection or connection with the F3SP-B1P Safety Relay Unit ✻1 | **F39-JCR2B** |
| | 0.5 m | | | **F39-JCR5B** |
| | 1 m | | | **F39-JC1B** |
| | 3 m | | | **F39-JC3B** |
| | 5 m | | Connection with the F3SP-B1P Safety Relay Unit ✻2 | **F39-JC5B** |
| | 7 m | | | **F39-JC7B** |
| | 10 m | | | **F39-JC10B** |
| | 15 m | | | **F39-JC15B** |
| | 20 m | | | **F39-JC20B** |
| | 30 m | | | **F39-JC30B** |
| | 40 m | | | **F39-JC40B** |

**✻1.** The F3SN-A□SS-04 Series is equipped with a 0.2-m series connection cable and does not require a Cable with Connectors on Both Ends for series connections. Purchase additional cables to extend cables that are too short.

**✻2.** The maximum length of series connection cables is 3 m. Longer cables cannot be used for series connections.

## Relays with Forcibly Guided Contacts and Safety Controllers

| Type | Appearance | Specification | Model | Remarks |
|---|---|---|---|---|
| G7SA Relays with Forcibly Guided Contacts |  | • No. of contacts: 4<br>• Contact output: 2NO + 2NC<br>• Rated switch load: 6 A at 250 VAC, 6 A at 30 VDC | **G7SA-2A2B** | Refer to G7SA on page 538 for other models, socket models, and other information. |
| | | • No. of contacts: 4<br>• Contact output: 3NO + 1NC<br>• Rated switch load: 6 A at 250 VAC, 6 A at 30 VDC | **G7SA-3A1B** | |
| G7S-□-E Relays with Forcibly Guided Contacts |  | • No. of contacts: 6<br>• Contact output: 4NO + 2 NC<br>• Rated switch load: 10 A at 250 VAC, 10 A at 30 VDC | **G7S-4A2B-E** | Refer to G7S-□-E on page 554 for other models, socket models, and other information. |
| | | • No. of contacts: 6<br>• Contact output: 3NO + 3NC<br>• Rated switch load: 10 A at 250 VAC, 10 A at 30 VDC | **G7S-3A3B-E** | |
| Dedicated Control Unit |  | • Quick connection/disconnection to the F3SN-A□SS with a Cable with Connectors on Both Ends.<br>• Contact output: 3NO + 1NC | **F3SP-B1P** | Use an F39-JC□B Cable with Connectors on Both Ends to connect to the F3SN-A□SS. |
| Muting Controller |  | • Connects up to two F3SN-A□SS sets and provides muting capability. | **F3SP-U2P** | Use an F39-JC□A or F39-JC□E□ Cable with Connector on One End to connect to the F3SN-A□SS.<br>Ask your OMRON representative for functions and other details. |

OMRON offers many Safety Application Controllers to help you build safety circuits.
Refer to *"Safety Application Controller Product Selection"* on page 568 and specifications on page 574.

## Setting Console

| Type | Appearance | Model | Remarks |
|---|---|---|---|
| Setting Console |  | **F39-MC11 ✻1, ✻2** | Accessories:<br>Branching Connector (1),<br>Connector Cap (1),<br>Special Cable (2 m),<br>Instruction Manual |
| Extra Branching Connector |  | **F39-CN1** | One Connector is supplied with the Setting Console. Order extras if needed. |

**✻1.** The functions described in this catalog are supported by firmware version 3 or later. They are not supported by products shipped prior to August 2003.

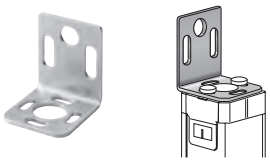
**✻2.** Functions not described in this catalog, such as blanking and output selection, are equivalent to those of the F3SN-A Safety Light Curtain. Refer to F3SN-A/F3SN-B, F3SH-A on page 378 for details.

## Maintenance Tool ✻

| Appearance | Model | Accessories |
|---|---|---|
|  | **F39-MT11** | Branching Connector (1),<br>Connector Cap (1),<br>Special Cable (2 m),<br>Special Cable with Plug (0.3 m),<br>Instruction Manual |

✻ For detail, see the product datasheet (Cat. No. E355).

## Mounting Brackets (Optional)

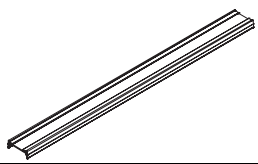
| Appearance | Specification | Model | Remarks |
|---|---|---|---|
|  | Wall mounting bracket<br>Material: Iron (zinc plating) ✻ | **F39-L18** | For Emitter: 2 pcs.<br>For Receiver: 2 pcs.<br>Total: 4 pcs./set |
|  | Free-location bracket<br>Materials: Zinc die-cast (zinc plating)<br>**Note:** Not provided with an angle deflection mechanism for beam control. | **F39-L19** | Minimum order quantity: 1 pc.<br>Mounting: Back-mounting only<br>Distance from the mounting surface: 7 mm<br>Recommended pitch: 670 mm max.<br>Beam adjustment: Not available (rotating direction) |
|  | Free-location bracket<br>Materials:<br>Sensor fixing element:<br>Zinc die-cast (zinc plating)<br>Mounting bracket: Iron (zinc plating)<br>**Note:** Provided with an angle deflection mechanism for beam control. | **F39-L20** | Minimum order quantity: 1 pc.<br>Mounting: Both front and back mounting<br>Distance from the mounting surface: About 15 mm<br>Recommended pitch: 400 mm max.<br>Beam adjustment: Available |

✻ Use these brackets for Sensors having a protective height where no intermediate bracket is required (with a protective height of less than 640 mm).

## External Indicator (Separate Models for Emitters and Receivers)

| Appearance | Specification | Indicator | Type | Model |
|---|---|---|---|---|
|  | M12 connector for PNP output | Red | Emitter | **F39-A01PR-L** |
| | | | Receiver | **F39-A01PR-D** |
| | | Green | Emitter | **F39-A01PG-L** |
| | | | Receiver | **F39-A01PG-D** |

## Spatter Protection Cover (Includes Two Pieces for Emitter and Receiver) (Each Unit Reduces the Operating Range by 10%)

| Appearance | Model |
|---|---|
|  | **F39-HN□□□□-25 ✻** |

✻ The same 4-digit numbers as protective heights (□□□□ in Light Curtain model numbers) are substituted by □□□□ in the model numbers.

# F3SN-A□SS

## Specifications Refer to the instruction manual for details.

### Main Unit Refer to page 414 for details on accessories.

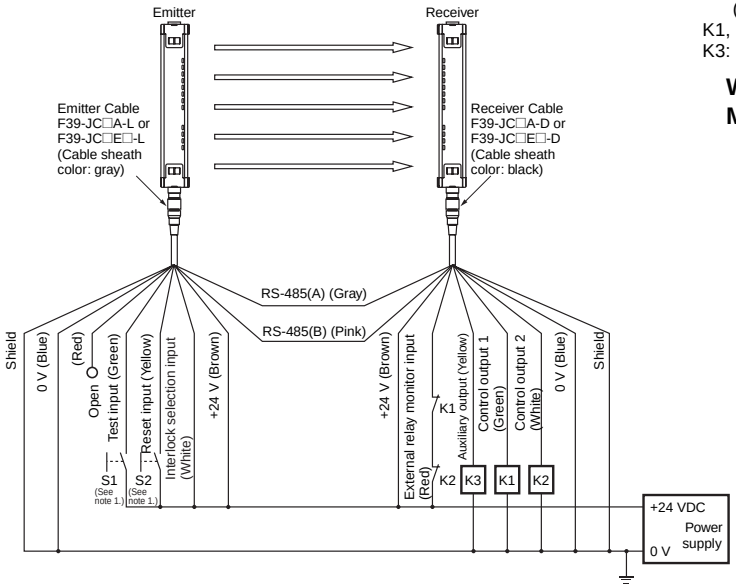
| Item | Model | F3SN-A□□□□P25SS (-□□) |
|---|---|---|
| Sensor type | | Type 4 Safety Light Curtain |
| Setting tool connection | | Connectable |
| Safety category | | Category 4, 3, 2, 1, or B |
| Detection capability | | Opaque objects: 25 mm in diameter |
| Beam gap (P) | | 15 mm |
| Number of beams (n) | | 13 to 118 (Refer to *"Ordering Information"* on page 412.) |
| Protective height (PH) | | 217 to 1792 mm, PH = (n-1) x P + 37 mm |
| Lens diameter | | Diameter 9 mm |
| Operating range | | 0.2 to 3.5 m |
| Response time (under stable light incident condition) (See ✻1 for series connections.) | ON→OFF | Protective height: 217 to 742 mm: 10.0 ms, 832 to 1222 mm: 12.5 ms, 1312 to 1792 mm: 15.0 ms |
| | OFF→ON | Protective height: 217 to 742 mm: 40 ms, 832 to 1222 mm: 50 ms, 1312 to 1792 mm: 60 ms |
| Startup waiting time | | 1 s max. |
| Power supply voltage (Vs) | | 24 VDC±10% (ripple p-p: 10% max.) |
| Current consumption (no load) | Emitter | Up to 50 beams: 140 mA max., 51 to 85 beams: 155 mA max., 86 beams or more: 170 mA max. |
| | Receiver | Up to 50 beams: 100 mA max., 51 to 85 beams: 110 mA max., 86 beams or more: 120 mA max. |
| Light source (emitted wavelength) | | Infrared LED (870 nm) |
| Effective aperture angle (EAA) | | Within ±2.5° for the Emitter and Receiver at a detection distance of at least 3 m according to IEC61496-2. |
| Control output (OSSD) | | Two PNP transistor outputs, load current: 300 mA max., residual voltage: 2 V max. (except for voltage drop due to cable extension), allowable capacity load 0.075 μF, leak current 2 mA max. |
| Auxiliary output (non-safety output) | | One PNP transistor output, load current: 50 mA max., residual voltage: 2 V max. (except for voltage drop due to cable extension) |
| External indicator output (non-safety output) ✻2 | | One PNP transistor output, load current: 40 mA max., residual voltage: 2 V max. (except for voltage drop due to cable extension) |
| Output operation mode | | Control output: Light-ON<br>Auxiliary output: Dark-ON (can be changed by the F39-MC11)<br>External indicator output: Light-ON (can be changed by the F39-MC11) ✻2 |
| Input voltage | | Test input, interlock selection input, reset input, and external relay monitor input voltages: ON voltage: 9 to 24 V (sink current: 3 mA max.), OFF voltage: 0 to 1.5 V or open |
| Indicators ✻3 | Emitter | Power indicator (green), interlock indicator (yellow), lockout indicator (red), test indicator (orange), error mode indicator (3 red), light intensity level indicator (green: 5 levels) |
| | Receiver | OFF-state indicator (red), ON-state indicator (green), lockout indicator (red), blanking indicator (green), error mode indicator (3 red), light intensity level indicator (green: 5 levels) |
| Mutual interference prevention function | | Time-shared beam projection system by series connection, Sensitivity Automatic sensitivity adjustment capability supported by the F39-MC11. |
| Series connections | | • Number of series connected Light Curtains: Up to 3 sets, • Number of beams: Up to 240 beams<br>• Length of the series connection cable: 3 m max. |
| Test functions ✻4 | | • Self test (when power is turned ON and while power is supplied, one cycle during response time)<br>• External test (light emission stop function by test input) |
| Safety functions ✻4 | | • Auto-reset/manual reset (interlock) ✻5, • External relay monitor, • Fixed blanking ✻6, • Floating blanking ✻6 |
| Connection method | | M12 Connector (8 pins) |
| Protective circuits | | Output short-circuit protection, reverse polarity protection |
| Ambient temperature | | Operating: −10 to 55°C, storage: −30 to 70°C (with no icing or condensation) |
| Ambient humidity | | Operating/storage: 35% to 95% (with no condensation) |
| Ambient operating light intensity | | Incandescent lamp: 3,000 lx max. (light intensity on the receiver surface)<br>Sunlight: 10,000 lx max. (light intensity on the receiver surface) |
| Insulation resistance | | 20 MΩ min.(at 500 VDC) |
| Dielectric strength | | 1000 VAC 50/60 Hz 1 min |
| Degree of protection | | IP65 (IEC60529) |
| Vibration resistance | | Malfunction: 10 to 55 Hz, 0.7-mm double amplitude, 20 sweeps in X, Y, and Z directions |
| Shock resistance | | Malfunction: 100 m/s$^2$, 1000 times in X, Y, and Z directions |
| Materials | | Case: Aluminum, end cap: Zinc die-cast, optical cover: PMMA resin (acrylic resin) |
| Weight (packed state) | | Weight (g) = (Protective height) x 2.4 +α+β, α = 700 when the protective height is 217 to 592 mm, α = 800 when the protective height is 667 to 1222 mm, α = 900 when the protective height is 1312 to 1792 mm, β = 0 for models with no suffix or ending with -01, β = 100 for models ending with -02, β = 200 for models ending with -04 |
| Accessories | | Test rod, instruction manual, error mode label, mounting brackets (top and bottom), mounting brackets (intermediate) ✻7 |
| Applicable standards | | IEC61496-1, EN61496-1 Type 4 ESPE (Electro-Sensitive Protective Equipment)<br>IEC61496-2 Type 4 AOPD (Active Opto-electronic Protective Devices) |

✻1. Use the following equations to determine series connection response time.
Series connection with two sets
Response time (ON→OFF): Sensor 1 response time + Sensor 2 response time + 3 ms
Response time (OFF→ON): Sensor 1 response time + Sensor 2 response time + 12 ms
Series connection with three sets
Response time (ON→OFF): Sensor 1 response time + Sensor 2 response time + Sensor 3 response time + 4 ms
Response time (OFF→ON): Sensor 1 response time + Sensor 2 response time + Sensor 3 response time + 16 ms
✻2. Models ending in -01 and -04 only.
✻3. The test indicator (orange) on the Emitter and the blanking indicator (green) on the Receiver will flash to indicate the need for preventive maintenance when the total ON time exceeds 30,000 hours.
✻4. The glossary and functions are the same as those for the F3SN-A Series. Refer to F3SN-A/F3SN-B, F3SH-A on page 378.
✻5. The default setting of the manual reset mode is for both "Start" and "Restart" interlocks. Use the F39-MC11 to select start interlock only or restart interlock only.
✻6. The function is not factory set. It can be set with the F39-MC11.
✻7. Intermediate mounting brackets are supplied with the following models:
When the overall Light Curtain length is 640 to 1280 mm or less: 1 set included
When the overall Light Curtain length is over 1280 mm: 2 sets included

# Connections

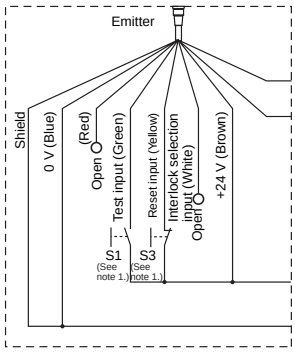
## Basic Connection

### Wiring for the manual reset mode and the EDM function




S1: External test switch
S2: Interlock/lockout reset switch
S3: Lockout reset switch
(If the switch is not necessary, connect between the reset input and +24 VDC.)
K1, K2: Relay that controls the dangerous parts of machines, etc.
K3: Load, PLC, etc. (used for monitoring)

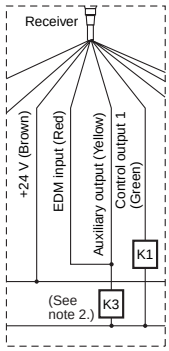
### Wiring for the Auto-reset Mode




**Note: 1.** Use a switch suitable for micro loads.
**2.** If K3 is not necessary, short-circuit the auxiliary output with the EDM input.

### When the EDM is Not Used

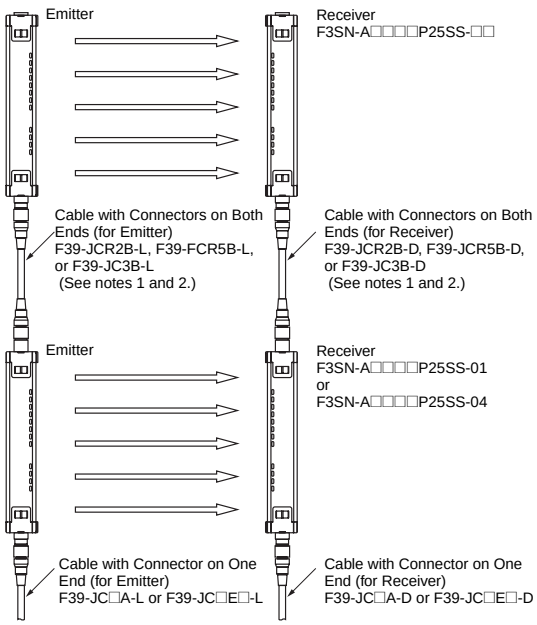
When the EDM is not necessary
**1.** Use the F39-MC11 to disable the EDM.
or
**2.** Disable the EDM by changing the wiring as shown in the figure below when the auxiliary output is set to the Dark-ON mode.




## Series Connection (Up to 3 Sets)

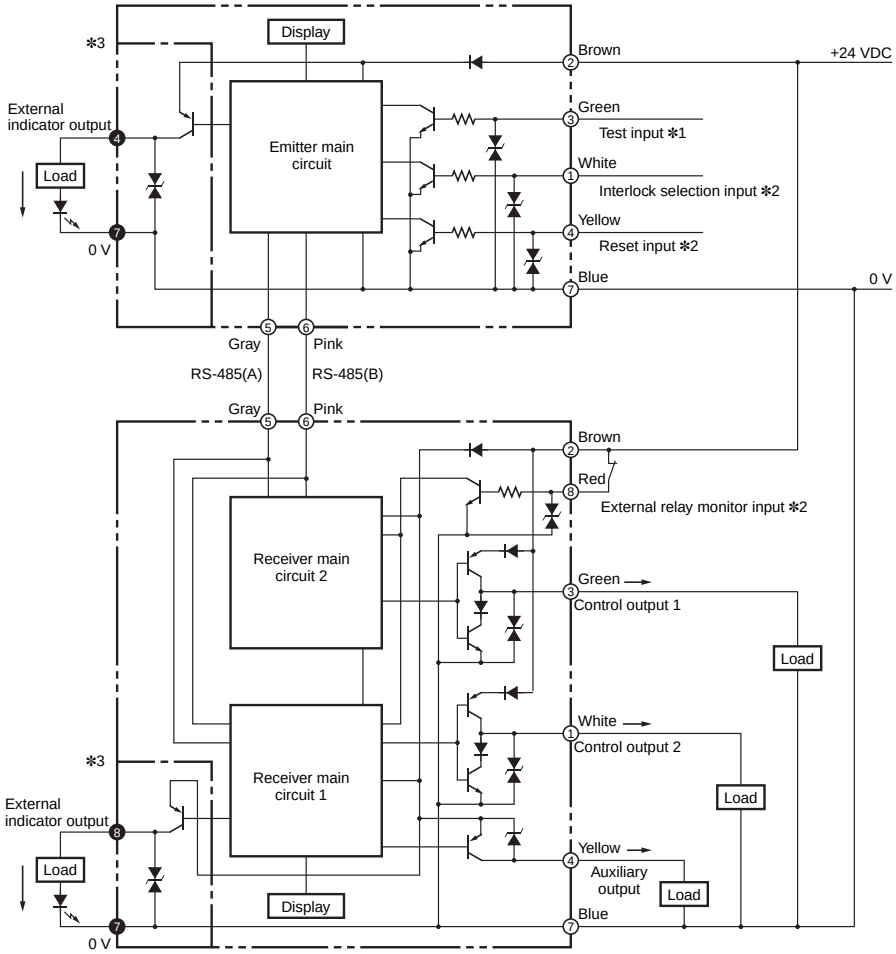
The use of series connection types (models ending in -01 or -04) enables series connection as shown in the figure at the right. Any type of Sensor can be used at the top end.

**Note: 1.** To maintain sensor performance, please use double-ended connector cables for series connection which are the length of F39-JC3B or shorter.
Double-ended connector cables that are longer than F39-JC7B cannot be used for series connection.
**2.** Models ending in -04 can be connected in series without an optional Cable with Connectors on Both Ends because they have a Connector with a 0.2-m cable on top.



# I/O Circuit Diagrams

## Circuit



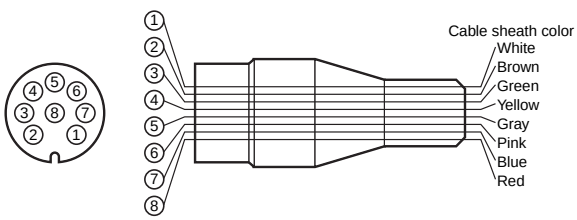

**Note:** The numbers in ❍ indicate pin numbers of the Connector.
The numbers in ● indicate pin numbers of the series connection Connectors.

**∗1.** Open: normal light emission, short: stops light emission

**∗2.** Refer to "*Connections: Basic Connection*" on page 419.

**∗3.** The section encircled with the dashed line applies to models ending in -01 and -04 only.

## Cable with Connector on One End

| Model | Internal wiring | Pin No. | Cable sheath color | Signal name | |
|---|---|---|---|---|---|
| | | | | Receiver | Emitter |
| F39-JCR5A (0.5 m)<br>F39-JC3A (3 m)<br>F39-JC7A (7 m)<br>F39-JC10A (10 m)<br>F39-JC15A (15 m)<br>F39-JC3E□ (3 m)<br>F39-JC7E□ (7 m)<br>F39-JC10E□ (10 m)<br>F39-JC15E□ (15 m) |  | 1 | White | Control output 2 | Interlock selection input |
| | | 2 | Brown | +24 V | +24 V |
| | | 3 | Green | Control output 1 | Test input |
| | | 4 | Yellow | Auxiliary output | Reset input |
| | | 5 | Gray | RS-485(A) | RS-485 (A) |
| | | 6 | Pink | RS-485(B) | RS-485 (B) |
| | | 7 | Blue | 0 V | 0 V |
| | | 8 | Red | EDM input | N.C. |

# Dimensions

(Unit: mm)

## Main Unit

### F3SN-A□□□P25SS-□□

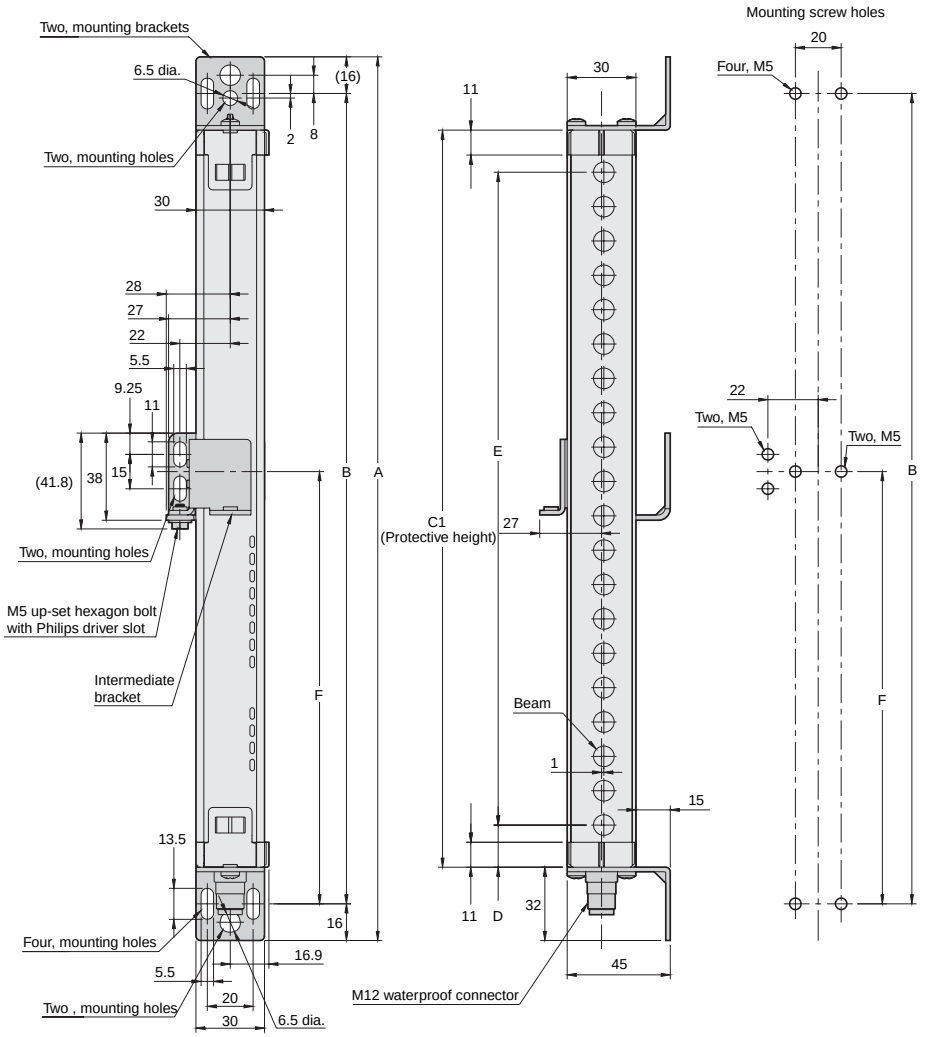
Dimensions can be calculated for each model by using the following equations.

Dimension C1 (protective height): 4 digits in the model name
Dimension A = C1 + 64
Dimension B = C1 + 32
Dimension D = 18.5
Dimension E = C1 - 37
Dimension F = Refer to the table right.

| Protective height (C1) | Number of intermediate mounting brackets | Dimension F (See note.) |
|---|---|---|
| to 0640 | 0 | --- |
| 0641 to 1280 | 1 | F = B/2 |
| 1281 to 1822 | 2 | F = B/3 |

**Note:** If value F obtained from the above equation is not used, set F to 670 mm or less.






## Mounting Precautions

**Note: 1.** The mounting bracket (3) (see Mounting Brackets (Intermediate)) is shown on the left-hand side of the Sensor as an example. If the mounting bracket (3) is on the right-hand side of the Sensor, then the mounting holes must also be on the right-hand side.

**2.** When using the cable bent, use a minimum bending radius of R = 36 mm. Fig. A shows an example when using a Cable with a Straight Connector. Fig. B shows the dimensions when using a Cable with a Right-angle Connector.

Fig. A

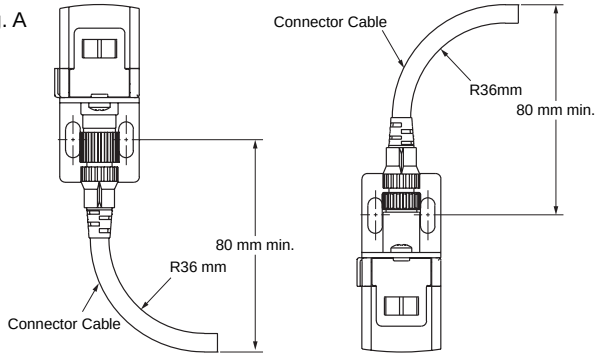
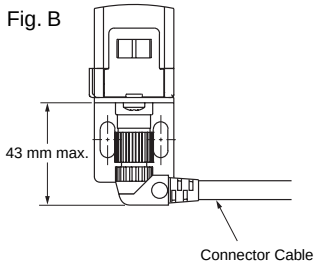
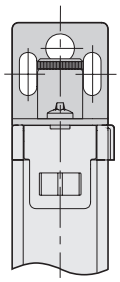


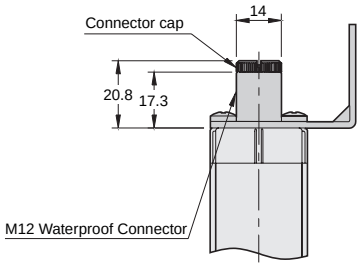

Fig. B



### F3SN-A□□□□P25SS-01

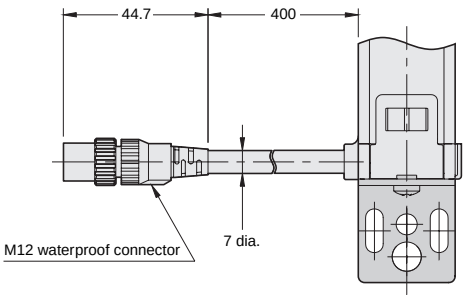


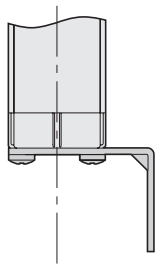





### F3SN-A□□□□P25SS-02

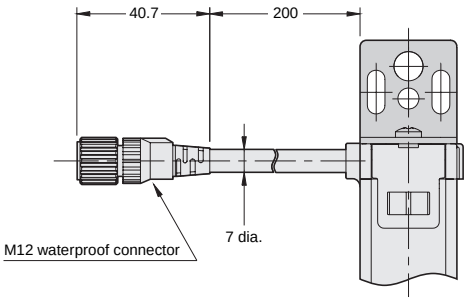


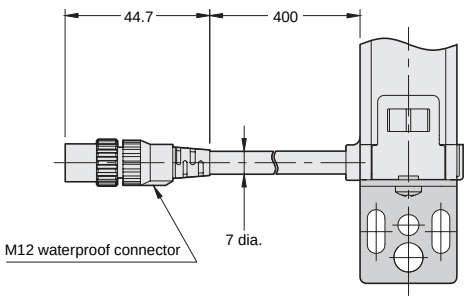


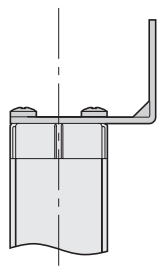



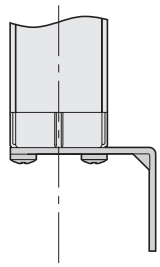
### F3SN-A□□□□P25SS-04







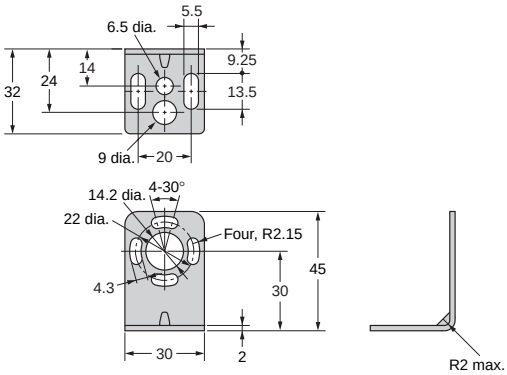
## Accessories

### Mounting Brackets (Top and Bottom)



Material: Iron (zinc plating)

**Note:** Provided with the main unit.

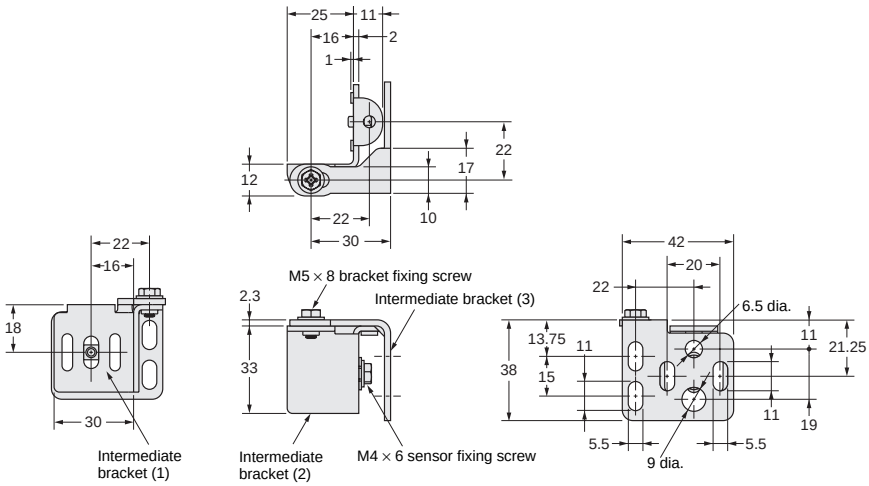



### Mounting Brackets (Intermediate)



Material: Iron (zinc plating)

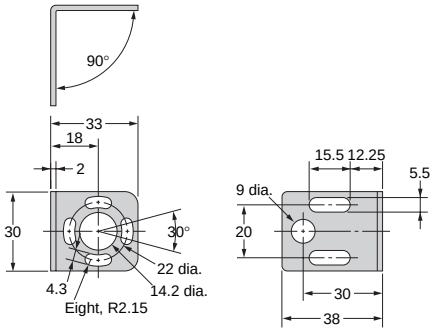
**Note:** Provided with the main unit. The number of brackets required depends on the total length of the Sensor.



## Accessories (Order Separately)

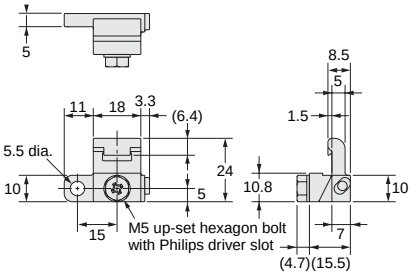
### Wall Mounting Bracket
**F39-L18**



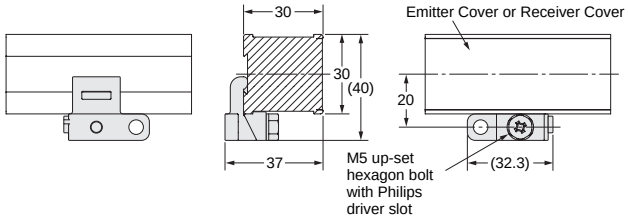



### Free-location Bracket
**F39-L19**



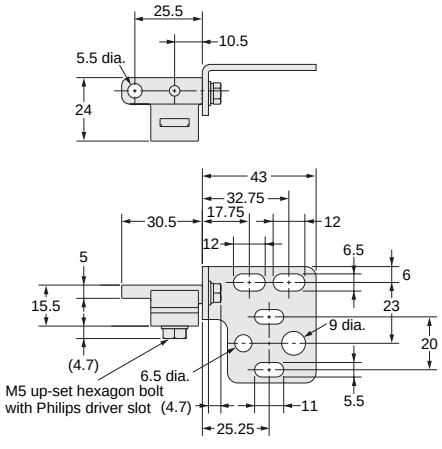


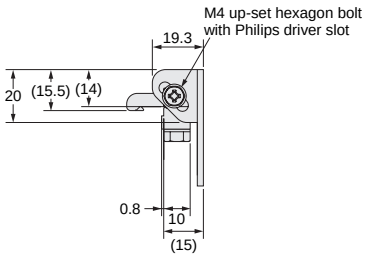

**Mounting**



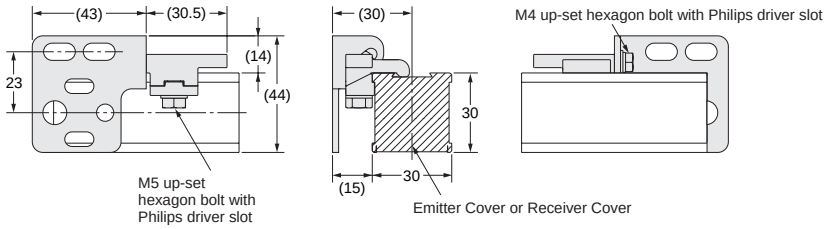

### Free-location Bracket
**F39-L20**



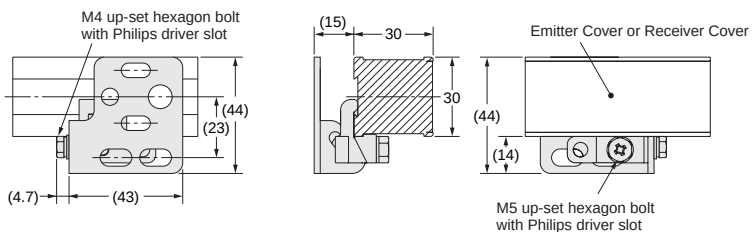



**Side mounting**



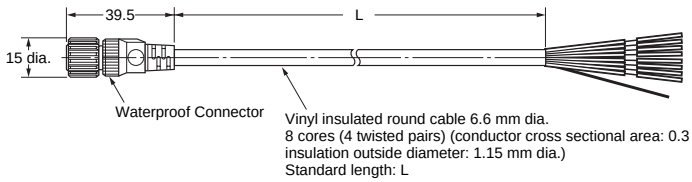

**Back mounting**



## Cable with Connector on One End with Straight Connectors

**F39-JC3A (L = 3 m)** **F39-JC10A (L = 10 m)**
**F39-JC7A (L = 7 m)** **F39-JC15A (L = 15 m)**



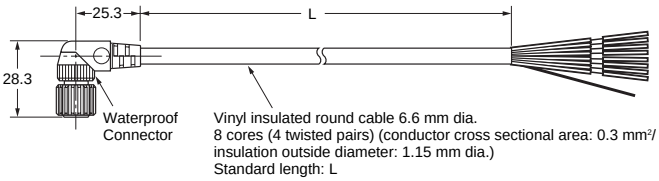



Color: Emitter (gray)
Receiver (black)

## Cable with Connector on One End with Right-angle Connectors

**F39-JC1E1 (L = 1 m)** **F39-JC1E2 (L = 1 m)**
**F39-JC3E1 (L = 3 m)** **F39-JC3E2 (L = 3 m)**
**F39-JC7E1 (L = 7 m)** **F39-JC7E2 (L = 7 m)**
**F39-JC10E1 (L = 10 m)** **F39-JC10E2 (L = 10 m)**
**F39-JC15E1 (L = 15 m)** **F39-JC15E2 (L = 15 m)**



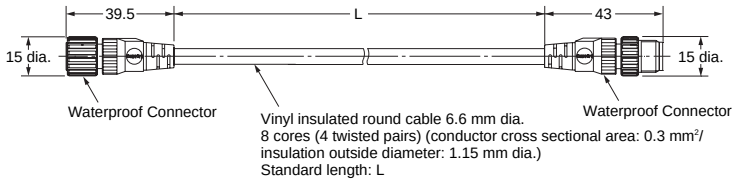



Color: Emitter (gray)
Receiver (black)

## Cable with Connectors on Both Ends with Straight Connectors

**F39-JCR2B (L = 0.2 m)** **F39-JC7B (L = 7 m)**
**F39-JCR5B (L = 0.5 m)** **F39-JC10B (L = 10 m)**
**F39-JC3B (L = 3 m)** **F39-JC15B (L = 15 m)**
**F39-JC5B (L = 5 m)** **F39-JC20B (L = 20 m)**





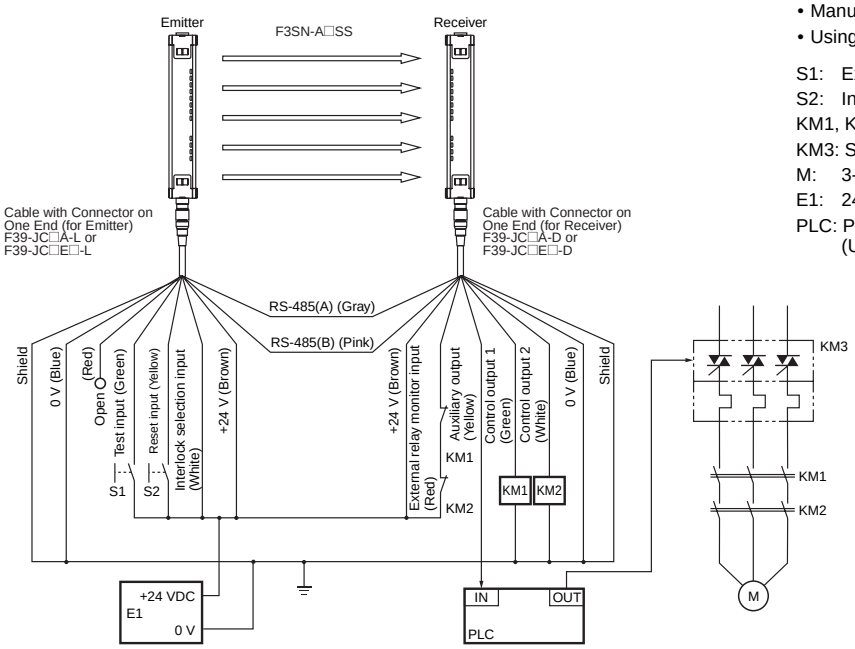

Color: Emitter (gray)
Receiver (black)

Refer to F3SN-A/F3SN-B, F3SH-A on page 378 for information not provided in the model number.

# Connection Circuit Examples

## An Example of Safety Circuits Where No Controller is Used

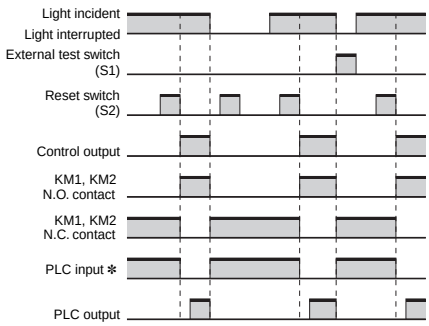
### For category 4 rating




Applicable operation mode
- Manual reset mode
- Using the external relay monitor function

S1: External test switch
S2: Interlock/lockout reset switch
KM1, KM2: Relay with forcibly guided contacts (G7SA)
KM3: Solid-state contactor (G3J)
M: 3-phase motor
E1: 24 VDC power supply (S82K)
PLC: Programmable Controller
(Used for monitoring. This is not a part of a safety system.)

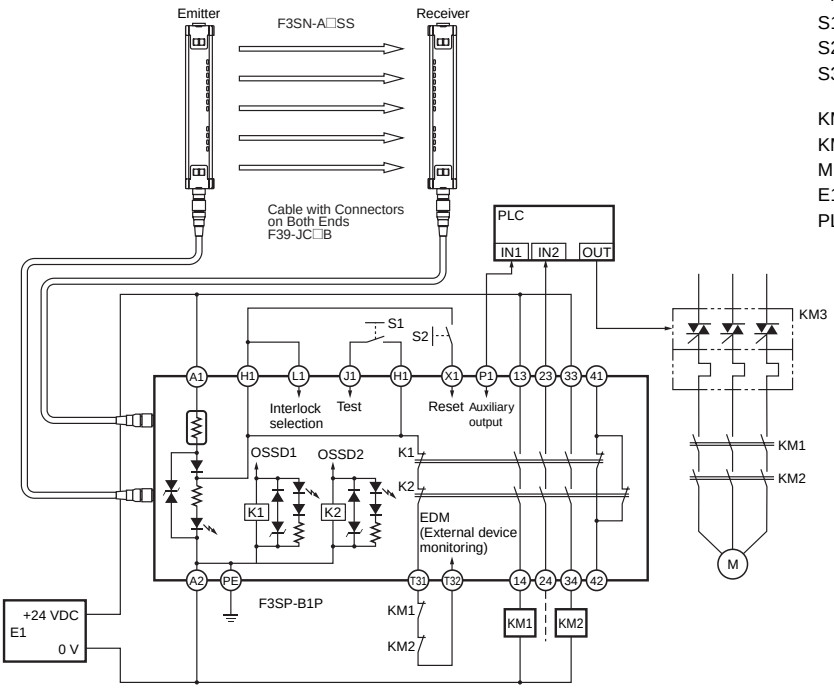
### Timing Chart




✻ The output operation mode of the auxiliary output is the Dark-ON output mode.

## An Example of Safety Circuits Where the F3SP-B1P Controller is Used

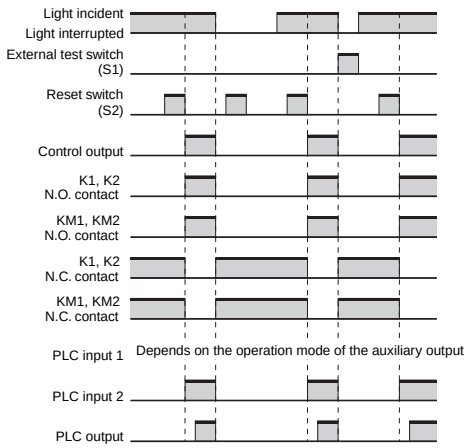
### For category 4 rating



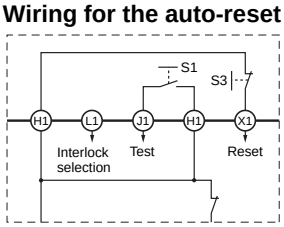

Applicable operation mode
- Manual reset mode

S1: External test switch
S2: Interlock/lockout reset switch
S3: Lockout reset switch (If the switch is not necessary, connect between X1 and H1.)
KM1, KM2: Relay with forcibly guided contacts (G7SA)
KM3: Solid-state contactor (G3J)
M: 3-phase motor
E1: 24 VDC power supply (S82K)
PLC: Programmable Controller
(Used for monitoring. This is not a part of a safety system.)

### Timing Chart



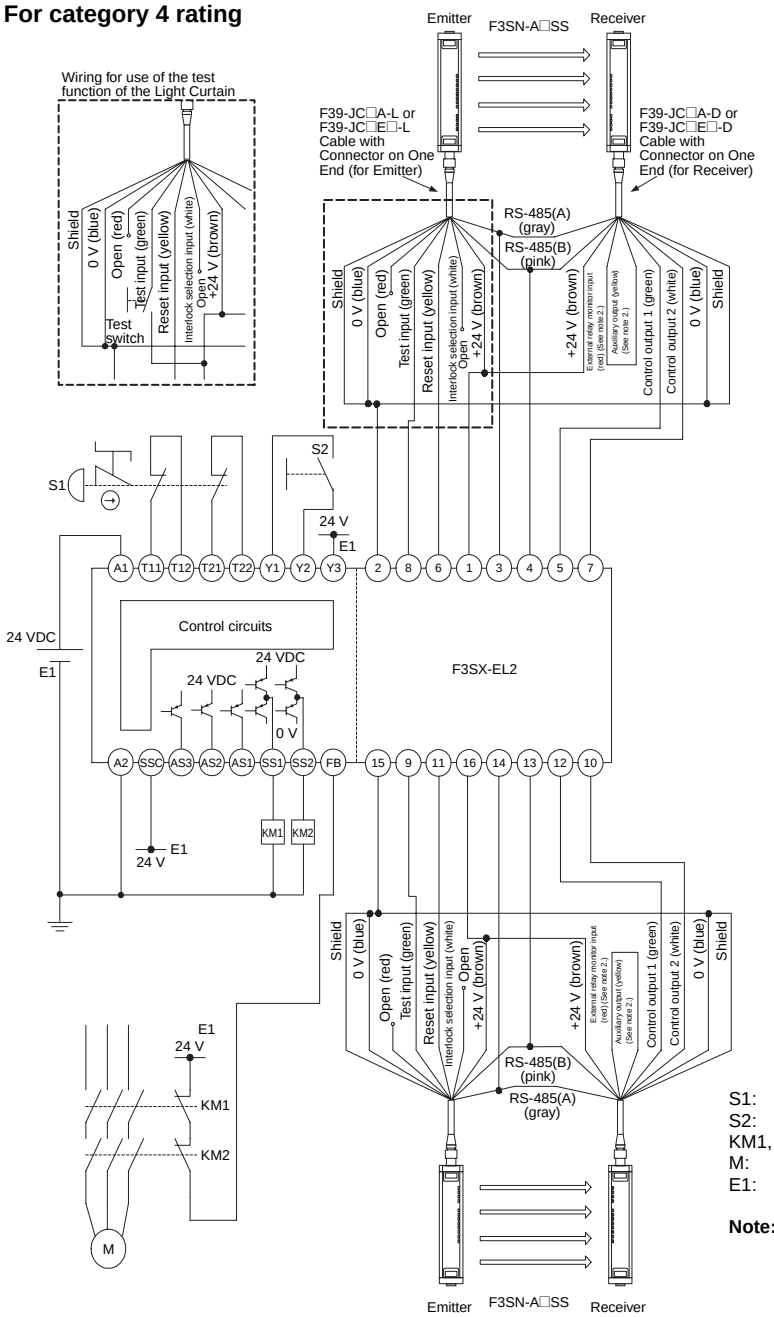

### Wiring for the auto-reset mode




**Note: 1.** If the EDM is not necessary, short-circuit T31 and T32.
**2.** For the number and arrangement of all terminals on the F3SP-B1P, see the instruction manual packaged together with the F3SP-B1P.

## An Example of Safety Circuits Where the F3SX Safety Controller is Used (with Two F3SN-A□SS Sets Connected)

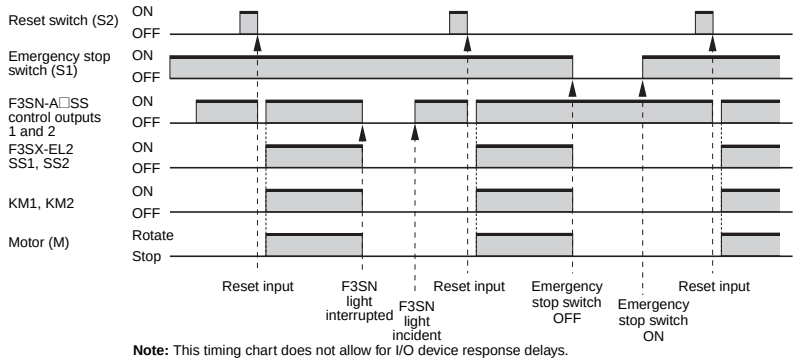
### F3SX-EL2 (Manual Reset)
### For category 4 rating




S1: Emergency stop switch (A165E, A22E)
S2: Reset switch
KM1, KM2: Relay with forcibly guided contacts
M: Three-phase motor
E1: 24-VDC power supply (S82K)

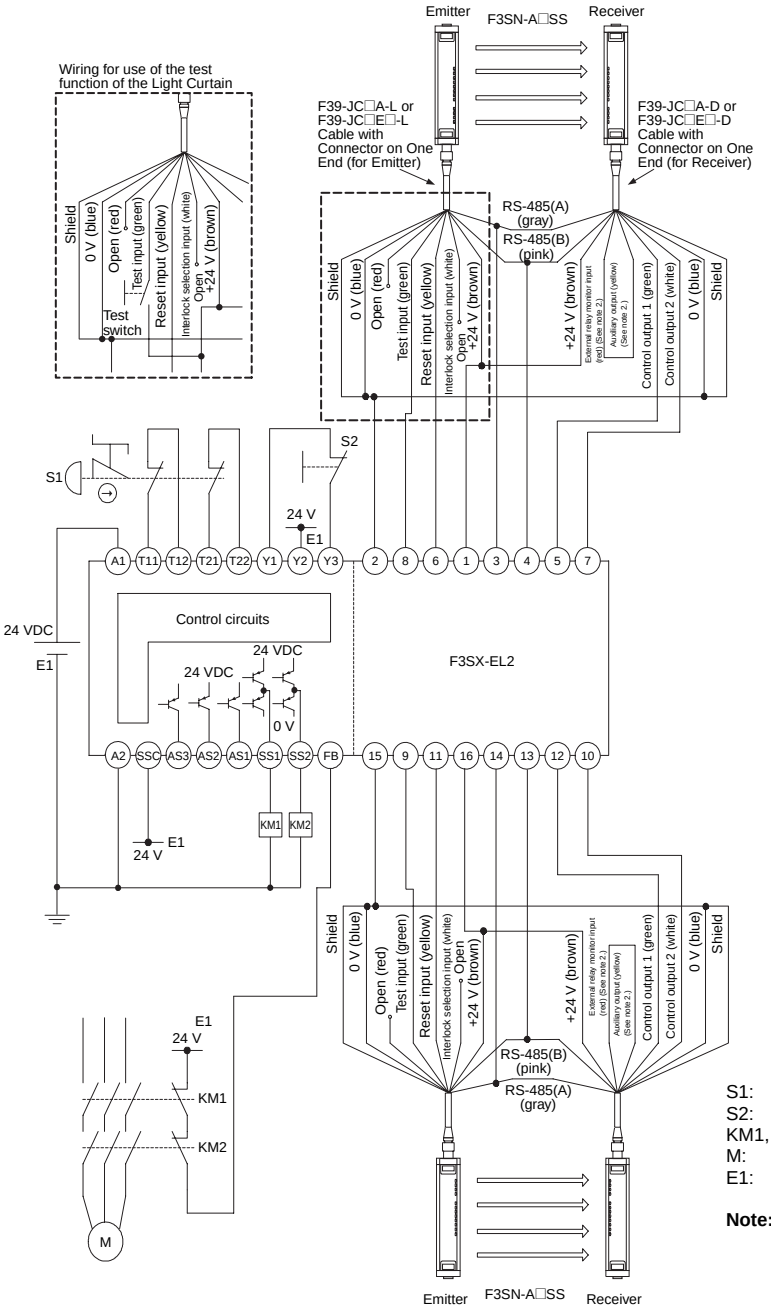
**Note: 1**. The above circuit diagram conforms to Category 4.
**2**. In this connection example, the auxiliary output is set to the standard setting (Dark-ON operation).
To operate using non-standard settings, refer to the catalog or *Instruction Manual* for the F3SN-A□SS.
Use the optional F39-MC11 Setting Console to disable the EDM.

### Timing Chart




**Note:** This timing chart does not allow for I/O device response delays.

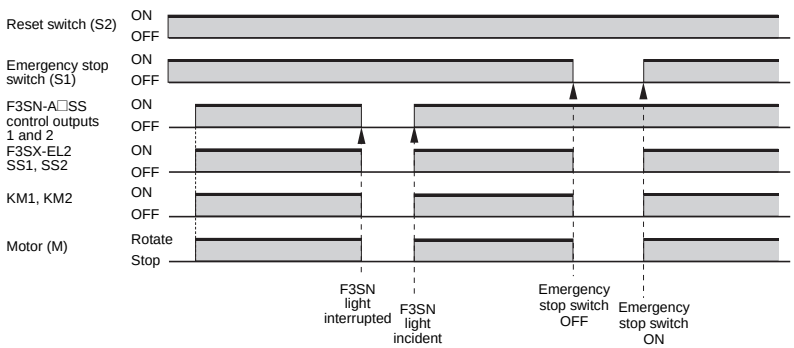
## F3SX-EL2 (Auto-reset)
## For category 4 rating




S1: Emergency stop switch (A165E, A22E)
S2: Reset switch
KM1, KM2: Relay with forcibly guided contacts
M: Three-phase motor
E1: 24-VDC power supply (S82K)

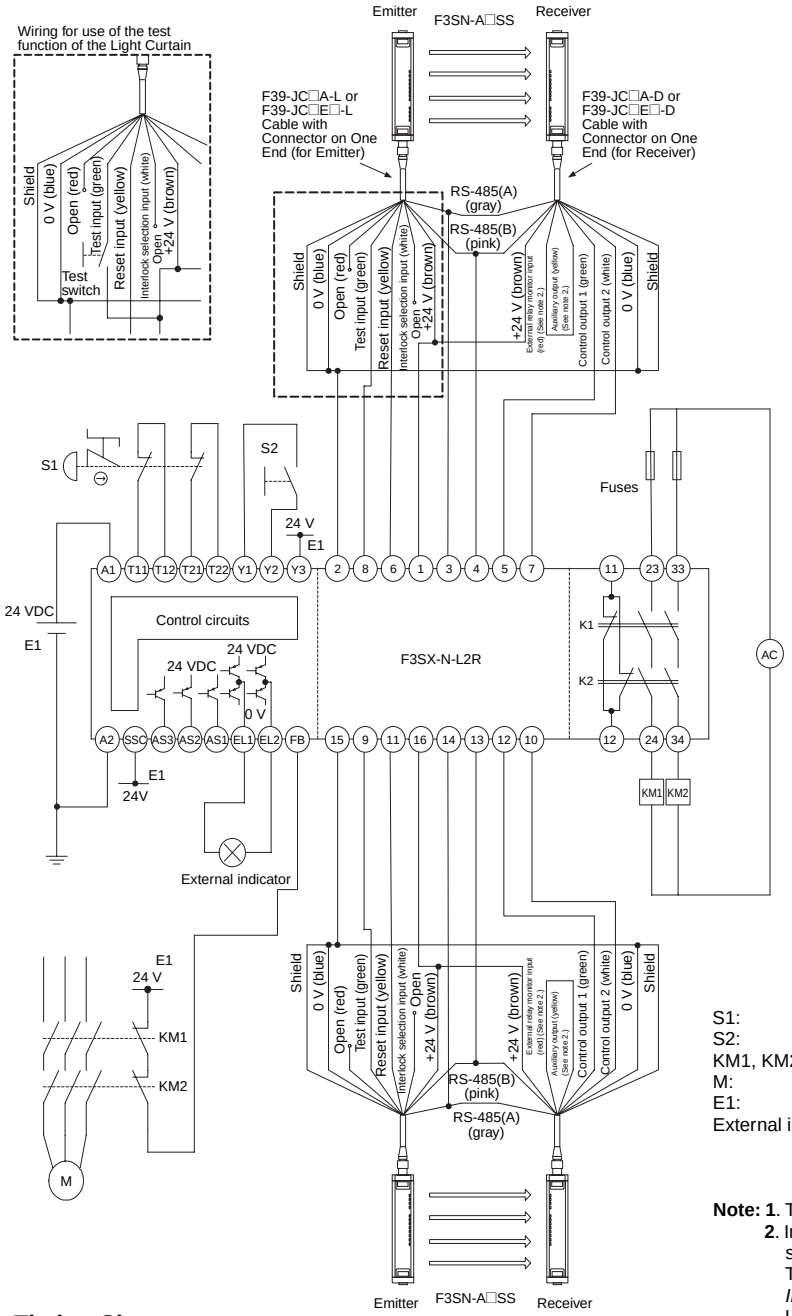
**Note: 1**. The above circuit diagram conforms to Category 4.
**2**. In this connection example, the auxiliary output is set to the standard setting (Dark-ON operation).
To operate using non-standard settings, refer to the catalog or *Instruction Manual* for the F3SN-A□SS.
Use the optional F39-MC11 Setting Console to disable the EDM.

### Timing Chart




**Note:** This timing chart does not allow for I/O device response delays.

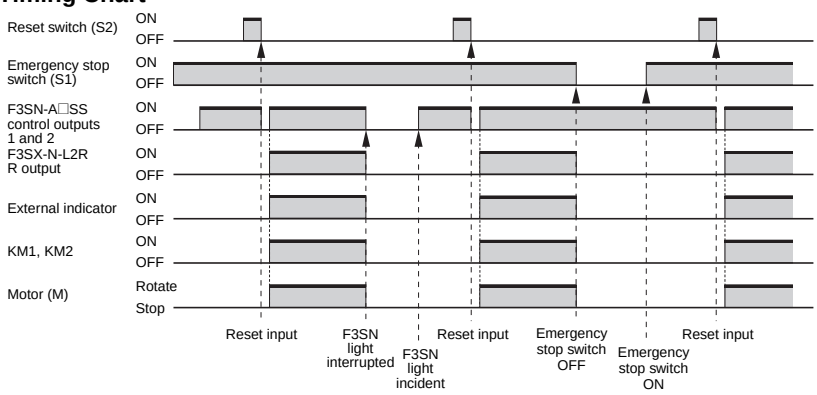
## F3SX-N-L2R (Manual Reset)
## For category 4 rating




S1: Emergency stop switch (A165E, A22E)
S2: Reset switch
KM1, KM2: Relay with forcibly guided contacts or magnetic contactor
M: Three-phase motor
E1: 24-VDC power supply (S82K)
External indicator: Filament-type indicator
(When an external indicator is not necessary, connect resistance of 1/4 W, 4.7 kΩ.)

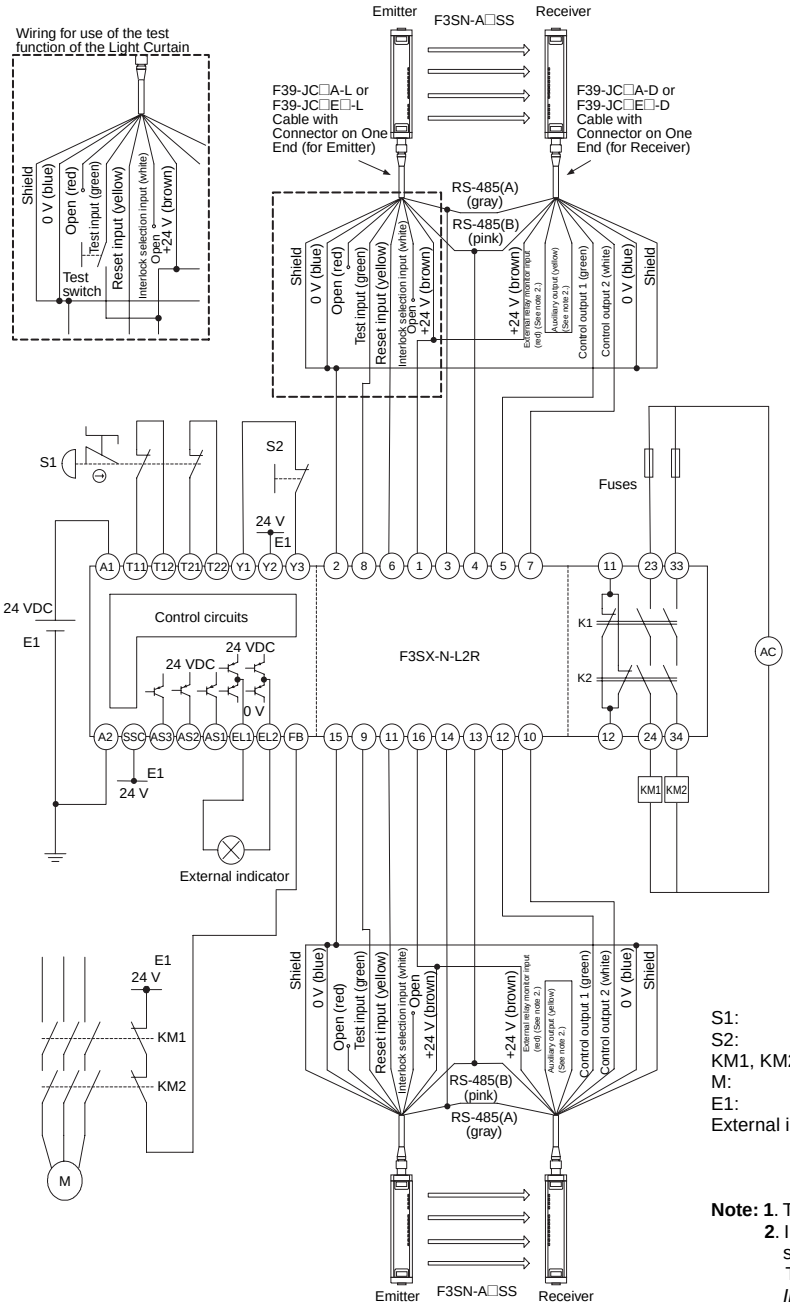
**Note: 1**. The above circuit diagram conforms to Category 4.
**2**. In this connection example, the auxiliary output is set to the standard setting (Dark-ON operation).
To operate using non-standard settings, refer to the catalog or *Instruction Manual* for the F3SN-A□SS.
Use the optional F39-MC11 Setting Console to disable the EDM.

### Timing Chart




**Note:** This timing chart does not allow for I/O device response delays.

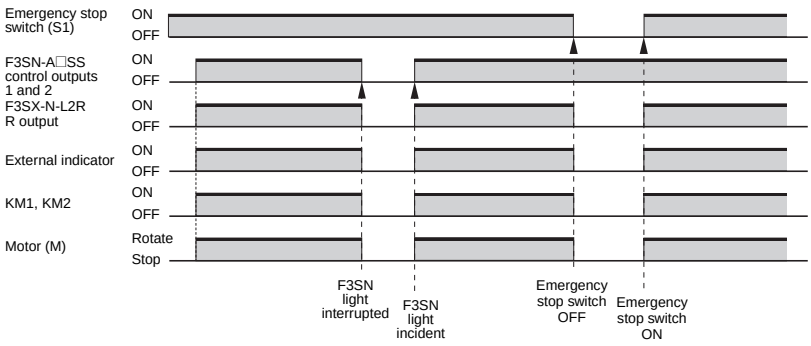
## F3SX-N-L2R (Auto-reset)
## For category 4 rating




S1: Emergency stop switch (A165E, A22E)
S2: Reset switch
KM1, KM2: Relay with forcibly guided contacts or magnetic contactor
M: Three-phase motor
E1: 24-VDC power supply (S82K)
External indicator: Filament-type indicator
(When an external indicator is not necessary, connect resistance of 1/4 W, 4.7 kΩ.)

**Note: 1**. The above circuit diagram conforms to Category 4.
**2**. In this connection example, the auxiliary output is set to the standard setting (Dark-ON operation).
To operate using non-standard settings, refer to the catalog or *Instruction Manual* for the F3SN-A□SS.
Use the optional F39-MC11 Setting Console to disable the EDM.

### Timing Chart




**Note:** This timing chart does not allow for I/O device response delay.

# Safety Precautions

Refer to "*Regulations and Standards*" and "*Safety Precautions*" for F3SN-A/F3SN-B/F3SH-A on page 378.
"Type Certification" specified in the Chapter 44. 2 of the Industrial Safety and Health Law in Japan does not apply to independent F3SS Sensors. This law applies to systems incorporating the Sensor. When using the F3SL Sensor in Japan as a "safety device for presses or shearing machines," as specified in the Chapter 42 of the same law, apply for certification for the overall system.

**⚠ WARNING**

## Detection Zone and Intrusion Path

Refer to "*Precautions for All Safety Sensors*" on page 242 for the installation conditions of Safety Light Curtains.

### · Use of the Fixed Blanking Function

Install protective structures in all parts of the detection zone where detection is disabled by the fixed blanking function so no one can pass through the detection zone to reach the hazardous part of the machine. Failure to do so may result in serious injury.

## Safety Distance

Always maintain a safety distance (S) between the Light Curtain and a hazardous part of a machine.
Failure to do so may prevent the machine from stopping before an operator reaches the dangerous area and may result in serious injury.

Floating blanking is used to increase the minimum detectable object size. Be sure to use the minimum detectable object size for floating blanking when calculating safety distance. Failure to do so may prevent the machine from stopping before an operator reaches the dangerous area and may result in serious injury.

Refer to the "*Precautions for All Safety Sensors*" on page 242 for calculating the safety distance.

**Precautions for Correct Use**

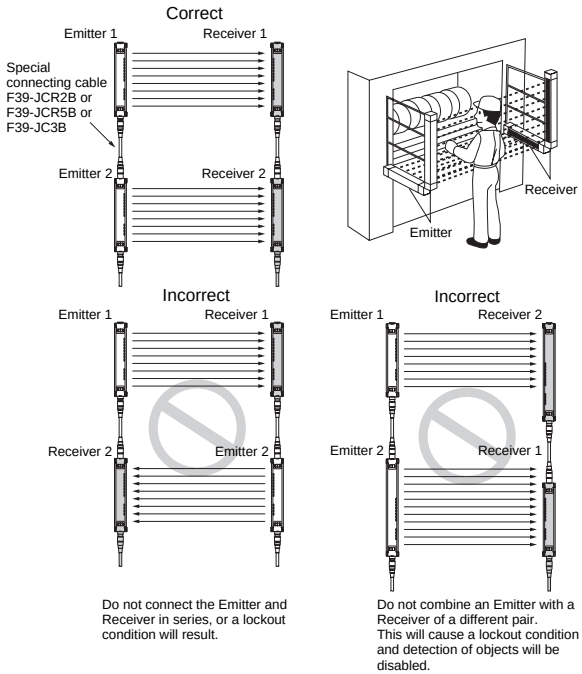
Do not used the product in atmospheres or environments that exceed product ratings.

## Installation

### How to Prevent Mutual Interference

### Series Connections (Up to 3 sets, 240 beams, Sensor models ending in -01 and -04 are required for series connection)

Two or more pairs of the F3SN-A□SS can be connected in series. When connected in series, the F3SN-A□SS Sensors generate beams in a time-sharing manner to prevent mutual interference and ensure safety.




### When Not Connected in Series

Refer to "*Precautions for All Safety Sensors*" on page 242 for information on preventing mutual interference of Safety Light Curtains that are not connected in series.

# E3ZS/E3FS

## Detects Intrusions into Hazardous Areas with a Single Beam and Complies with International Safety Standards.



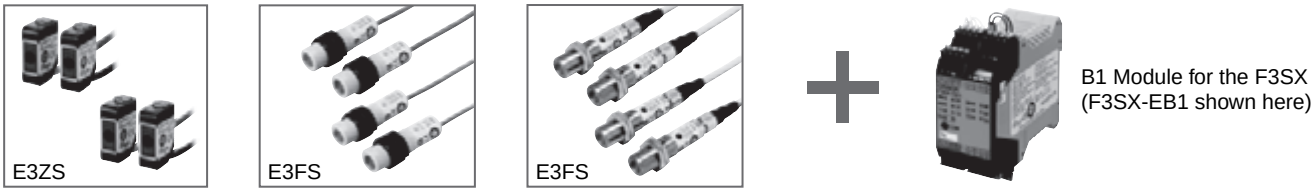

⚠ Be sure to read the *"Safety Precautions"* on page 446 and the *"Precautions for All Safety Sensors"* on page 242.



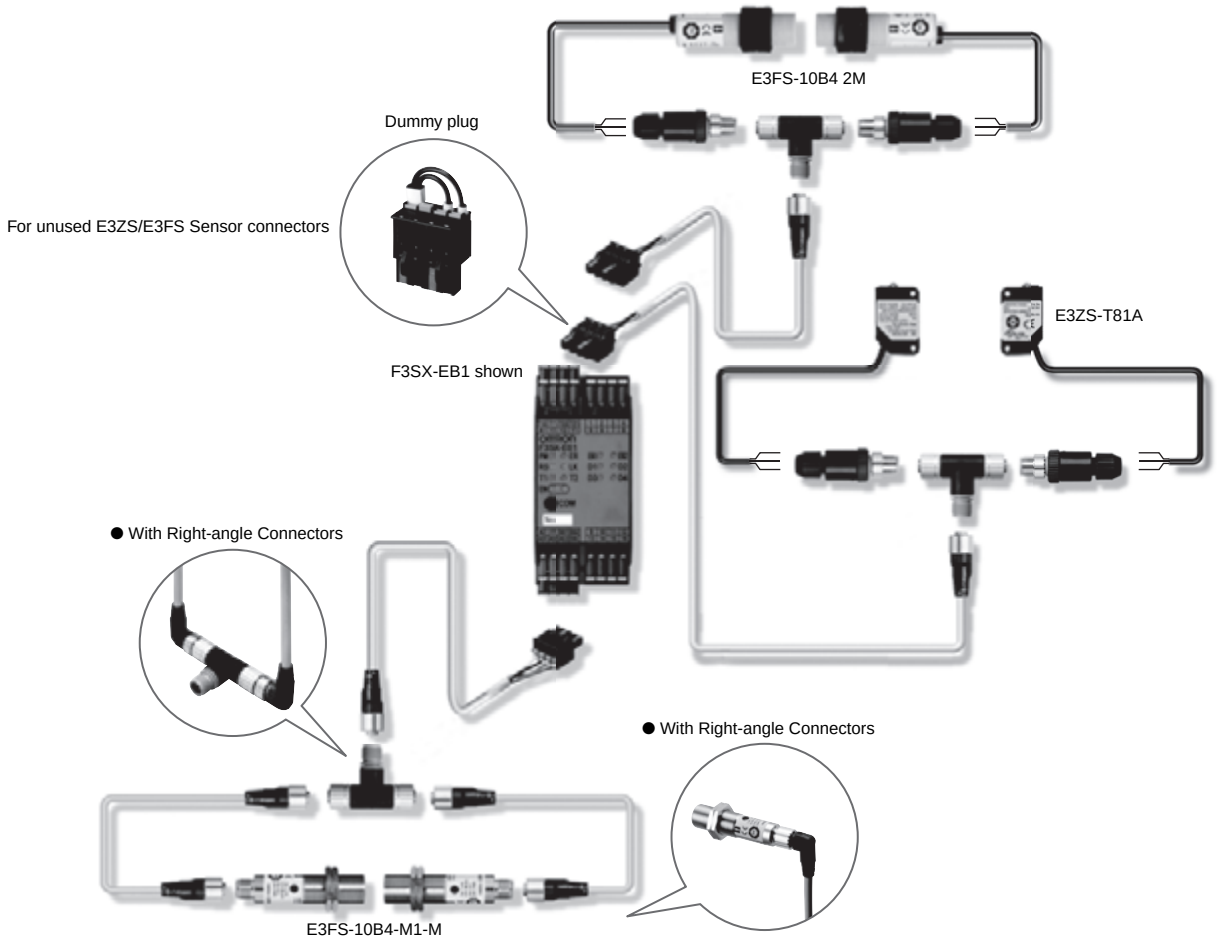
## Features

### Connect up to 4 sets of E3ZS/E3FS per B1 Module for F3SX Safety Controller
### Connect to a B1 Module for F3SX to Create a Type 2 Safety Sensor

**Note:** The B1 Module is designed specifically for E3ZS/E3FS input of the F3SX. The safety output turns OFF when light is interrupted or when an error occurs with one or more of the E3ZS/E3FS Sensors connected to the B1 Module.

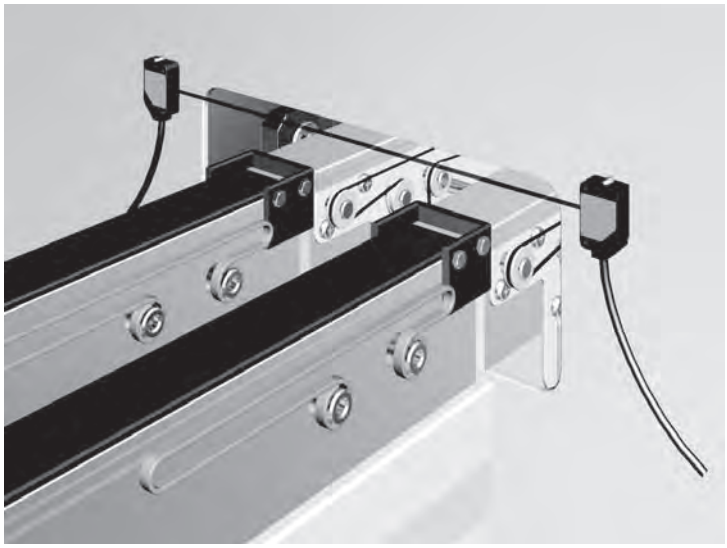



### Connects simply and easily using a wide range of accessories.



# Application Examples

## For gaps in small-sized equipment



**Protect personnel from the hazards of gaps in small-sized equipment or of semi-automated machinery.**

The E3ZS is a Human Body Detection Sensor (Type 2) for production equipment. Make sure to use it in combination with an F3SX Safety Controller.

When used by itself, the E3ZS conforms to EN954-1 (Category 1). No particular safety restrictions apply to the E3ZS when used by itself, except the inability to use in human detection safety applications. We recommend using it in Light ON mode and using it with error detection via test input.

**Note:** Test Input
Use this function to enable the emitter of E3ZS to be turned ON/OFF from outside. It is possible to detect a number of E3ZS errors by monitoring the status of the test input and the E3ZS output signal.

## For gaps in small to medium-sized equipment



**Use as a safety measure for protection from hazardous gaps or as guards for medium-sized equipment.**

The E3FS is a Human Body Detection Sensor (Type 2) for production equipment. Make sure to use it in combination with a F3SX Safety Controller. A combination of E3FS and E3ZS Sensors can be connected to the B1 Module of the F3SX.

**Note:** Since the E3FS has not received any safety certification for use by itself, make sure to connect it with an F3SX for use in safety applications.

# Ordering Information

## Sensors

Red light  Infrared light

| Sensor method | Appearance | Case material | Connection method | Sensing distance | Output | Model |
|---|---|---|---|---|---|---|
| Through-beam |  | Polybutylene terephthalate | Pre-wired cable (2 m) | 0.2 to 3 m | PNP | **E3ZS-T81A** |
| |  | ABS | | 10 m | | **E3FS-10B4 2M** |
| |  | Brass | M12 connector | 10 m | | **E3FS-10B4-M1-M** |

## Controller

### Instant Breaking Models

**F3SX-N-□□□R (with Relay Safety Output)**

| Input types | | | | Model | Width (W) | Weight |
|---|---|---|---|---|---|---|
| E3ZS/E3FS Safety Sensors | F3SJ/F3SN/F3SH Safety Light Curtains | Emergency Stop Switches | Door Switches | | | |
| 4 sets | --- | 1 set | --- | **F3SX-N-B1R** | 90.0 mm | Approx. 0.5 kg |
| 4 sets | --- | 1 set | 2 sets | **F3SX-N-B1D1R** | 112.5 mm | Approx. 0.6 kg |
| 4 sets | --- | 1 set | 4 sets | **F3SX-N-B1D1D1R** | 135.0 mm | Approx. 0.7 kg |
| 4 sets | 2 sets | 1 set | --- | **F3SX-N-L2B1R** | 112.5 mm | Approx. 0.6 kg |

### Instant Breaking Models

**F3SX-E-□□□ (with DC Solid-state Safety Output)**

| Input types | | | | Model | Width (W) | Weight |
|---|---|---|---|---|---|---|
| E3ZS/E3FS Safety Sensors | F3SJ/F3SN/F3SH Safety Light Curtains | Emergency Stop Switches | Door Switches | | | |
| 4 sets | --- | 1 set | --- | **F3SX-EB1** | 45.0 mm | Approx. 0.3 kg |
| 8 sets | --- | 1 set | --- | **F3SX-E-B1B1** | 67.5 mm | Approx. 0.4 kg |
| 4 sets | --- | 1 set | 2 sets | **F3SX-E-B1D1** | 67.5 mm | Approx. 0.4 kg |
| 4 sets | 2 sets | 1 set | --- | **F3SX-E-L2B1** | 67.5 mm | Approx. 0.4 kg |

### Instant Breaking Models

**F3SX-E-□□□R (with Relay Safety Output and DC Solid-state Safety Output)**

| Input types | | | | Model | Width (W) | Weight |
|---|---|---|---|---|---|---|
| E3ZS/E3FS Safety Sensors | F3SJ/F3SN/F3SH Safety Light Curtains | Emergency Stop Switches | Door Switches | | | |
| 4 sets | --- | 1 set | --- | **F3SX-E-B1R** | 90.0 mm | Approx. 0.5 kg |

### OFF-delay Time Setting Models (Using Function Setup Software for the F3SX)

**F3SX-N-□□□RR2 (with Relay Safety Output and DC Solid-state Safety Output)**

| Input types | | | | Model | Width (W) | Weight |
|---|---|---|---|---|---|---|
| E3ZS/E3FS Safety Sensors | F3SJ/F3SN/F3SH Safety Light Curtains | Emergency Stop Switches | Door Switches | | | |
| 4 sets | --- | 1 set | 2 sets | **F3SX-N-B1D1RR2** | 157.5 mm | Approx. 0.7 kg |
| 4 sets | 2 sets | 1 set | --- | **F3SX-N-L2B1RR2** | 157.5 mm | Approx. 0.7 kg |

### OFF-delay Time Setting Models (Using Function Setup Software for the F3SX)

**F3SX-E-□□□R2 (with Relay Safety Output and DC Solid-state Safety Output)**

| Input types | | | | Model | Width (W) | Weight |
|---|---|---|---|---|---|---|
| E3ZS/E3FS Safety Sensors | F3SJ/F3SN/F3SH Safety Light Curtains | Emergency Stop Switches | Door Switches | | | |
| 4 sets | --- | 1 set | --- | **F3SX-E-B1R2** | 90.0 mm | Approx. 0.5 kg |
| 4 sets | --- | 1 set | 2 sets | **F3SX-E-B1D1R2** | 112.5 mm | Approx. 0.6 kg |
| 4 sets | 2 sets | 1 set | --- | **F3SX-E-L2B1R2** | 112.5 mm | Approx. 0.6 kg |

The F3SX-series Safety Controller is a multiple input, single output Controller. This is useful for individual control over the safety output when using multiple safety input devices. Custom models are also available. Refer to the F3SX on page 652, and consult with your OMRON representative.

## Accessories

### Branch Connector

| Appearance | Model |
|---|---|
|  | **F39-CN3** |

### Dummy Plug

| Appearance | Model |
|---|---|
|  | **F39-CN4** |

### Cables with Connectors on Both Ends for Branch Connector

| Appearance | Model | Cable length |
|---|---|---|
|  | **F39-JF1S** | 1 m |
| | **F39-JF2S** | 2 m |
| | **F39-JF5S** | 5 m |
| | **F39-JF10S** | 10 m |

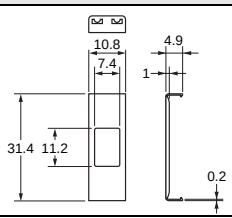
### Sensor Mounting Bracket (for E3FS)

| Appearance | Model |
|---|---|
|  | **Y92E-B18** |

### Sensor Mounting Bracket (for E3ZS)

| Appearance | Model |
|---|---|
|  | **E39-L104** |

### Mutual Interference Prevention Filter (for E3ZS)

| Dimensions | Model | Quantity | Remarks |
|---|---|---|---|
|   | **E39-E11** | 2 per Emitter and Receiver (4 total) | For use with E3ZS-T81A. This filter prevents mutual interference by changing the direction of polarized light of the 2 adjacent Emitter/ Receivers. However, when the filter is attached, the maximum sensing distance of the E3ZS is reduced to 1.5 m. |

## Cables with Connectors (Socket and Plug) on Both Ends

| Type | Cable connection direction | Cable length L (m) | DC Model | UL standard |
|---|---|---|---|---|
| Standard cable | Straight/straight | 1 | **XS2W-D421-C81-A** | ● |
| | | 2 | **XS2W-D421-D81-A** | |
| | | 5 | **XS2W-D421-G81-A** | |
| | | 10 | **XS2W-D421-J81-A** | |
| | Right angle/right angle | 2 | **XS2W-D422-D81-A** | |
| | | 5 | **XS2W-D422-G81-A** | |
| | Straight/right angle | 2 | **XS2W-D423-D81-A** | |
| | | 5 | **XS2W-D423-G81-A** | |
| | Right angle/straight | 2 | **XS2W-D424-D81-A** | |
| | | 5 | **XS2W-D424-G81-A** | |
| Robot cable (vibration resistant) | Straight/straight | 1 | **XS2W-D421-C81-R** | --- |
| | | 2 | **XS2W-D421-D81-R** | |
| | | 5 | **XS2W-D421-G81-R** | |
| | | 10 | **XS2W-D421-J81-R** | |

**Note:** Extend the cable under the following conditions.
- Overall cable length for both an E3FS Receiver connected to an F3SX and the Emitter connected to the F3SX must be within 50 m.
- Overall cable length for both an E3ZS Receiver connected to an F3SX and the Emitter connected to the F3SX must be within 100 m.

## Cables with Connector (Socket) on One End

| Type | Cable connection direction | Cable length L (m) | DC Model | UL standard |
|---|---|---|---|---|
| Standard cable | Straight | 1 | **XS2F-D421-C80-A** | ● |
| | | 2 | **XS2F-D421-D80-A** | |
| | | 5 | **XS2F-D421-G80-A** | |
| | | 10 | **XS2F-D421-J80-A** | |
| | Right angle | 1 | **XS2F-D422-C80-A** | |
| | | 2 | **XS2F-D422-D80-A** | |
| | | 5 | **XS2F-D422-G80-A** | |
| | | 10 | **XS2F-D422-J80-A** | |
| Robot cable (vibration resistant) | Straight | 1 | **XS2F-D421-C80-R** | --- |
| | | 2 | **XS2F-D421-D80-R** | |
| | | 5 | **XS2F-D421-G80-R** | |
| | | 10 | **XS2F-D421-J80-R** | |
| | Right angle | 1 | **XS2F-D422-C80-R** | |
| | | 2 | **XS2F-D422-D80-R** | |
| | | 5 | **XS2F-D422-G80-R** | |
| | | 10 | **XS2F-D422-J80-R** | |

**Note:** Extend the cable under the following conditions.
- Overall cable length for both an E3FS Receiver connected to an F3SX and the Emitter connected to the F3SX must be within 50 m.
- Overall cable length for both an E3ZS Receiver connected to an F3SX and the Emitter connected to the F3SX must be within 100 m.

## Connector Plug Assemblies, Solder Type ✻

| Applicable cable diameter (mm) | Cable connection direction | Connection method | Model |
|---|---|---|---|
| 3 dia. (3 to 4 dia.) | Straight | Solder | **XS2G-D425** |
| | Right angle | | **XS2G-D426** |

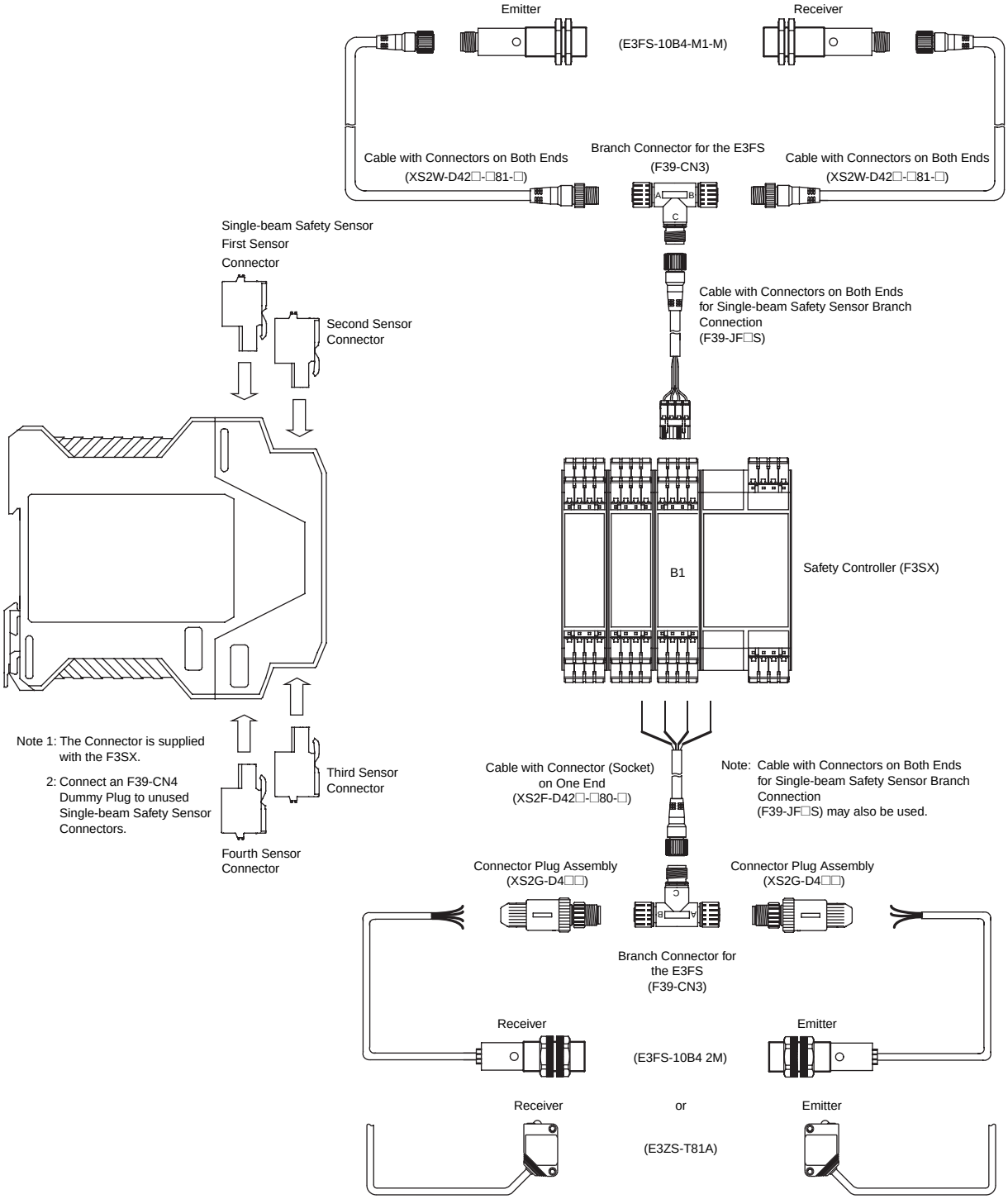
✻ Use when connecting an E3ZS-T81A or E3FS-10B4 2M to an F39-CN3 Branch Connector.

## Connector Plug Assemblies, Screw-on Type ✻

| Applicable cable diameter (mm) | Cable connection direction | Connection method | Model |
|---|---|---|---|
| 3 dia. (3 to 4 dia.) | Straight | Screw-on | **XS2G-D4S5** |
| | Right angle | | **XS2G-D4S6** |

✻ Use when connecting an E3ZS-T81A or E3FS-10B4 2M to an F39-CN3 Branch Connector.

## Accessory Connection Example



# Specifications

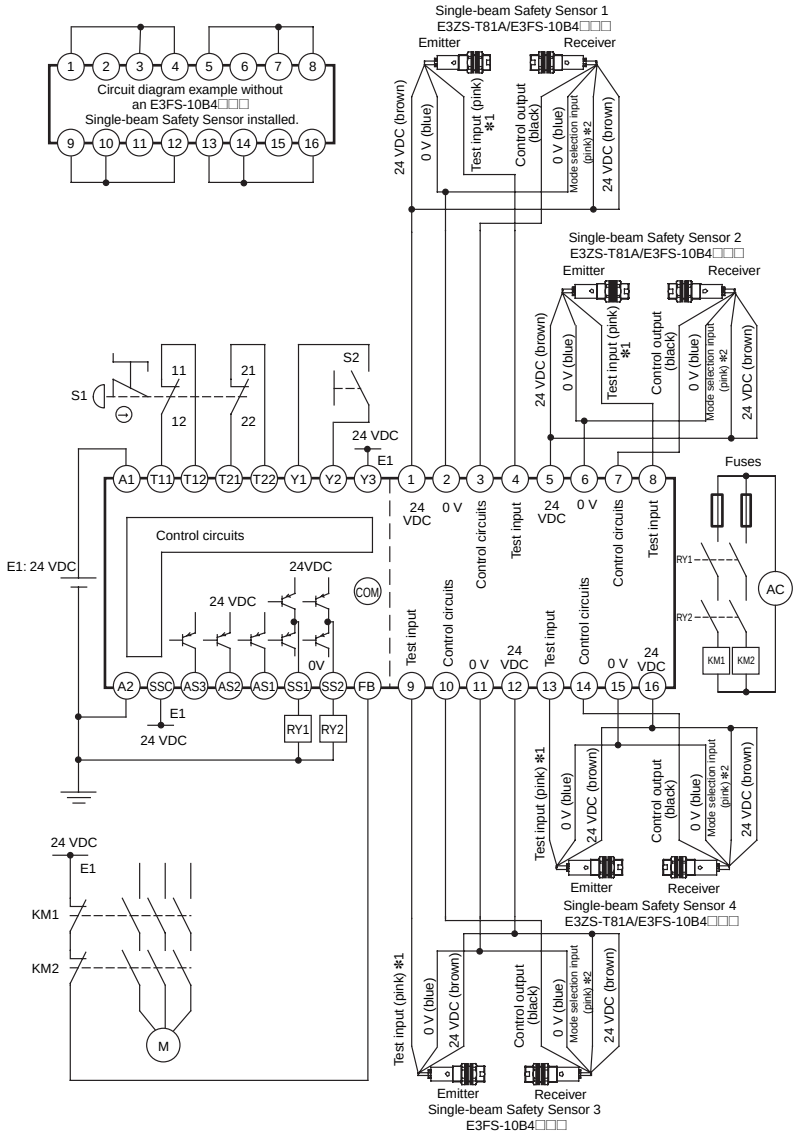
| Item \ Model | | E3ZS-T81A | E3FS-10B4 2M | E3FS-10B4-M1-M |
|---|---|---|---|---|
| **Sensor type** | | Through-beam models | | |
| **Safety category** | | See Applicable standards. | | |
| **Standard sensing object** | | Opaque object: 18 mm in diameter or greater | Opaque object: 11 mm in diameter or greater | |
| **Lens diameter** | | Diameter 6.7 mm / diameter 9 mm | | |
| **Sensing distance** | | 0.2 to 3 m | 0 to 10 m | |
| **Response time (under stable light incident condition)** | | 1.0 ms (E3ZS only) ✻1 | 2.0 ms (E3FS only) ✻1 | |
| **Startup waiting time** | | 100 ms | | |
| **Power supply voltage (Vs)** | | 12 to 24 VDC±10% (ripple p-p 10% max.) ✻2 | 24 VDC±10% (ripple p-p 10% max.) ✻2 | |
| **Current consumption (no load)** | | Emitter: 15 mA max.<br>Receiver: 20 mA max. | Emitter: 50 mA max.<br>Receiver: 25 mA max. | |
| **Light source (emitted wavelength)** | | Red LED (660 nm) | Infrared LED (870 nm) | |
| **Effective aperture angle (EAA)** | | ±5° (at 3 m) | | |
| **Control output (OSSD)** | | PNP transistor output, load current: 100 mA max., Residual voltage: 1 V max., (when load current is less than 10 mA), Residual voltage: 2 V max. (when load current is between 10 mA and 100 mA) (except for voltage drop due to cable extension) ✻2 | PNP transistor output, load current: 100 mA max., Residual voltage: 2 V max. (except for voltage drop due to cable extension) ✻2 | |
| **Output operation mode** | | Light-ON ✻3 | | |
| **Input voltage** | | 22.5 to 24 VDC: Emitter OFF (source current: 3 mA max.)<br>Open or 0 to 2.5 V: Emitter ON (leakage current: 0.1 mA max.) ✻2 | 21.5 to 24 VDC: Emitter OFF (source current: 3 mA max.)<br>Open or 0 to 2.5 V: Emitter ON (leakage current: 0.1 mA max.) ✻2 | |
| **Indicators** | | Emitter: Emitting (orange);<br>Receiver: Operation (orange), Stable (green) | Emitter: Emitting (orange);<br>Receiver: Output OFF (red), Output ON (green) | |
| **Test functions** | | External test (light emission stop function by test input) | | |
| **Connection method** | | Pre-wired cable (2 m) | | M12 connector |
| **Protective circuits** | | Power supply/output reverse connection protection, load short-circuit protection | Output reverse connection protection, load short-circuited protection | |
| **Ambient temperature** | | Operating: −10 to 55°C<br>Storage: −10 to 70°C<br>(with no icing or condensation) | Operating: −20 to 55°C<br>Storage: −30 to 70°C<br>(with no icing or condensation) | |
| **Ambient humidity** | | Operating: 35% to 85%, storage: 35% to 95% (with no icing or condensation) | | |
| **Ambient operating light intensity** | | Incandescent lamp: 3000 lx max (light intensity on the receiver surface).<br>Sunlight: 10,000 lx max (light intensity on the receiver surface). | | |
| **Insulation resistance** | | 20 MΩ min. (at 500 VDC) | | |
| **Dielectric strength** | | 1000 VAC 50/60 Hz 1 min | | |
| **Degree of protection** | | IP67 (IEC standard) | | |
| **Vibration resistance** | **Operating limit** | 10 to 55 Hz, double amplitude: 0.7 mm, 50 min each in the X, Y, and Z directions | | |
| | **Malfunction** | 10 to 55 Hz, double amplitude: 1.5 mm, 2 h each in the X, Y, and Z directions | | |
| **Shock resistance** | **Operating limit** | 100 m/s$^2$, 1000 times in the X, Y, and Z directions | | |
| | **Malfunction** | 500 m/s$^2$, 3 times each in the X, Y, and Z directions | | |
| **Material** | | Case: Polybutylene terephthalate | Case: ABS | Case: Brass |
| **Weight (packed state)** | | Approx. 120 g (for one set including 2-m cable) | Approx. 150 g (for one set including 2-m cable) | Approx. 125 g (for one set including only Sensor) |
| **Accessories** | | Operation manual ✻4 | Operation manual ✻4, nuts for mounting Emitter/Receiver (2 each) | |
| **Applicable standards** | **Sensor only** | IEC 60947-5-3 (PDF-D) EN954-1 (Category 1) | --- | |
| | **Sensor connected to F3SX** | IEC (EN) 61496-1 Type 2 ESPE ✻5,<br>IEC (prEN) 61496-2 Type 2 AOPD ✻6,<br>EN 954-1 (Category 2) | IEC(EN)61496-1 Type2 ESPE ✻5<br>IEC(prEN)61496-2 Type2 AOPD ✻6 | |
| **Switching element category (from IEC60947-5-3)** | | DC13 (control of electromagnetic load) | --- | |
| **Controller** | | F3SX Series | | |

✻**1.** This may vary according to the F3SX model connected to the Sensor. For details, refer to the F3SX operation manual.
✻**2.** Connect the Sensor to an F3SX to use it as a safety device or as part of a safety system.
✻**3.** Depending on the wiring, this may turn ON when light is interrupted.
For your safety, be sure to connect the pink receiver wire (mode selection input) to 24 VDC to turn ON when light is incident.
✻**4.** F3SX operation manual is not included.
✻**5.** Electro-Sensitive Protective Equipment
✻**6.** Active Opto-electronic Protective Device

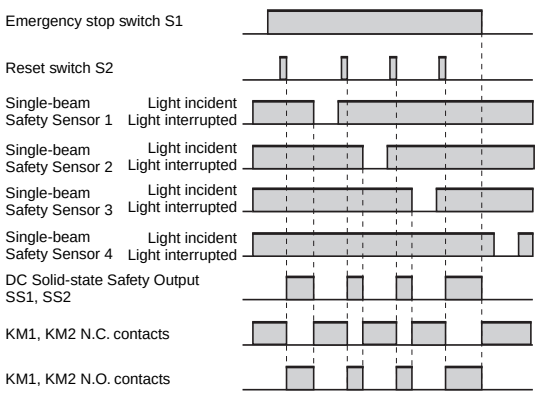
# Connections

## Circuit Diagram Example

### F3SX-EB1 (Manual Reset)




### Timing Chart




S1: Emergency stop switch with positive opening mechanism (A165E or A22E) ⊖
S2: Reset switch
KM1, KM2: Magnetic contactor
RY1, RY2: Relay
M: Three-phase motor
E1: 24-VDC power supply (S82K)

**Note: 1.** The above circuit diagram example conforms to Category 2.
**2.** The EN60204-1 stop function category is 0 (zero) for the example in the above circuit diagram.
**3.** When the FB (feedback input) function of the F3SX is not used, make setting changes with the F3SX function setup software (F3SX-CD100-E1).

**✻1.** The black wire is used when the Cable with Connector (Socket) on One End (XS2F-D42□-□80-□) is connected to an E3FS-10B4-M1-M Connector.

**✻2.** The white wire is used when the Cable with Connector (Socket) on One End (XS2F-D42□-□80-□) is connected to an E3FS-10B4-M1-M Connector.

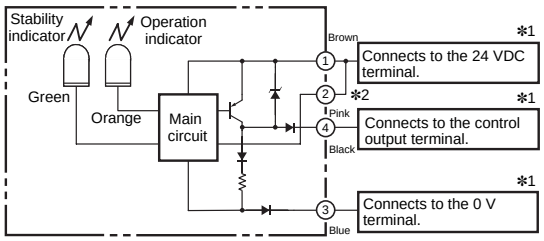
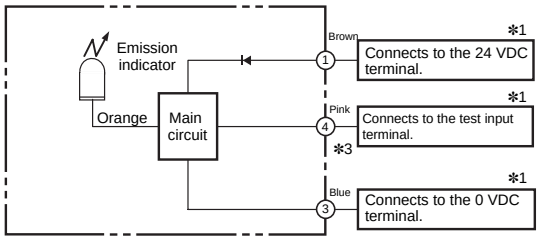
For connections, refer to the F3SX operation manual.

# I/O Circuit Diagrams

## E3ZS

### Circuit Diagrams (E3ZS-T81A with PNP Output)

Output mode: ON when light is incident (Light ON)

| | I/O circuit |
|---|---|
| Receiver |  |
| Emitter |  |



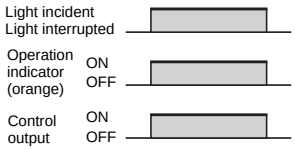
∗1. When using in Safety Category 2 configurations, make sure all terminals on the B1 Module of the F3SX are properly connected. Do not connect the terminals to another module. See the F3SX operation manual for details.

∗2. Make sure to connect the pink wire (mode selection input 2) to 24 VDC.

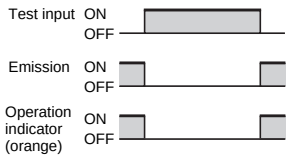
∗3. Make sure to connect to the 0V terminal when the E3ZS is not connected to an F3SX and the test input is not used.

### Timing Charts

#### Output Modes and Timing Char




#### Emitter Timing Chart

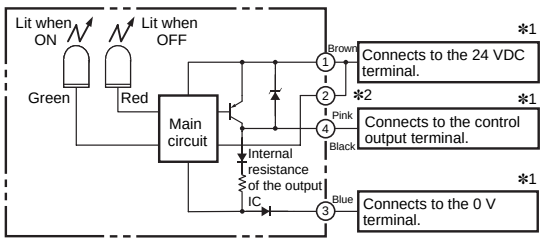
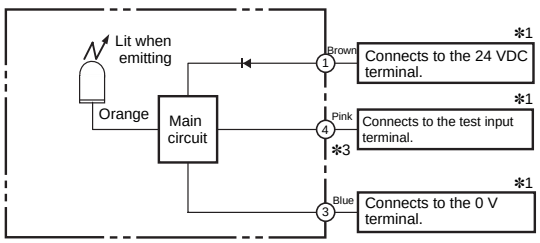



**Note:** The F3SX performs self-diagnosis every 20 ms.

## E3FS

### Circuit Diagrams (E3FS-10B4□□□ with PNP Output)

Output mode: ON when light is incident (Light ON).

| | I/O circuit |
|---|---|
| Receiver |  |
| Emitter |  |



∗1. Make sure all terminals on the B1 Module of the F3SX are properly connected. Do not connect the terminals to another Module. See the F3SX operation manual for details.

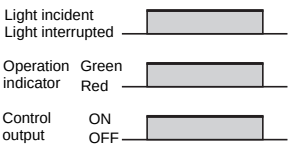
∗2. Make sure to connect the pink wire (mode selection input 2) to 24 VDC.

∗3. Make sure to connect to the 0V terminal when the E3FS is not connected to an F3SX and the test input is not used.

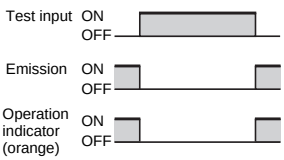
**Note:** The E3FS-10B4□□□ functions as a standalone Sensor when it is connected as shown in the wiring diagram above. However, it is certified a Type 2 Safety Sensor when it is properly connected to the B1 Module of the F3SX. This also means it must be properly connected to an F3SX to use it as part of a safety system.

### Timing Charts

#### Output Modes and Timing Chart



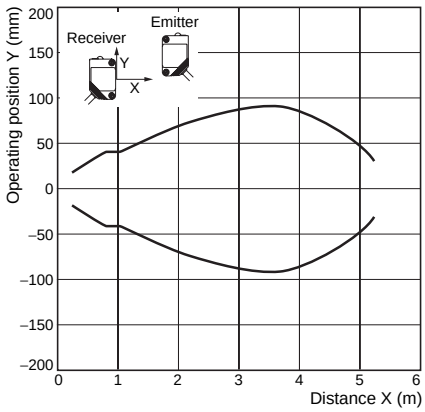

#### Emitter Timing Chart



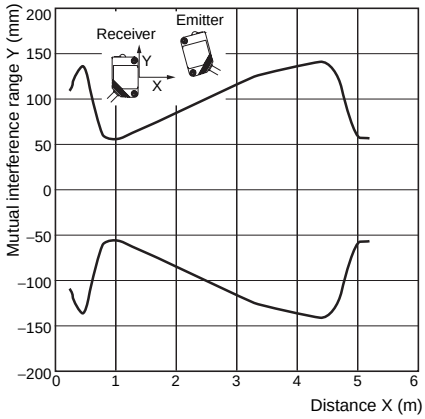
# Engineering Data

## E3ZS

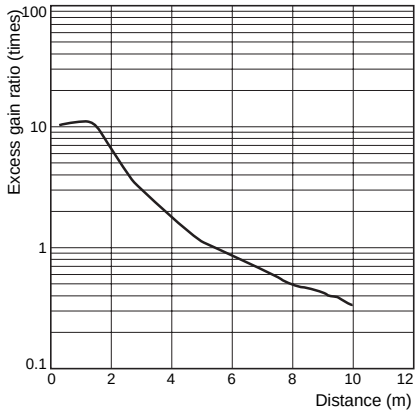
### Parallel Operating Range




### Mutual Interference Range

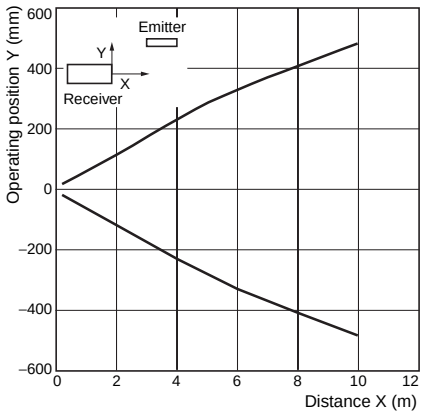



### Excess Gain Ratio

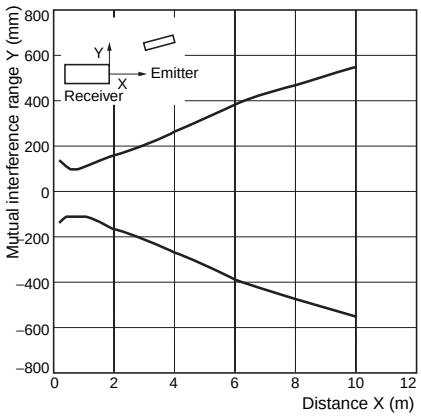



## E3FS

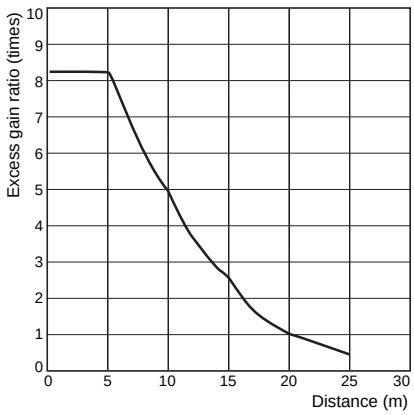
### Parallel Operating Range




### Mutual Interference Range




### Excess Gain Ratio



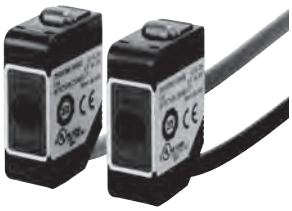
# Dimensions

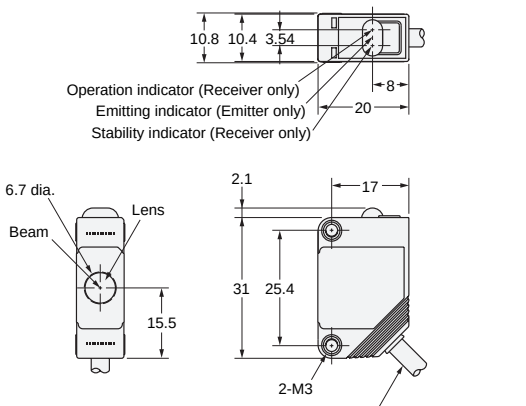
(Unit: mm)

## Sensors

### Pre-wired Cable with ABS Resin Case

**E3ZS-T81A**



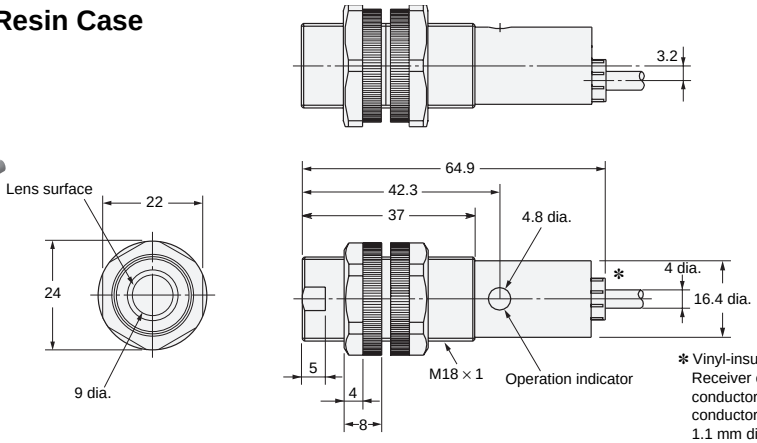



Vinyl-insulated round cord with four Receiver conductors and three Emitter conductors, 4 dia. (cross sections of conductors: 0.2 mm$^2$, insulation system: 1.1 mm dia.) Standard length: 2 m

### Pre-wired Cable with ABS Resin Case

**E3FS-10B4 2M**



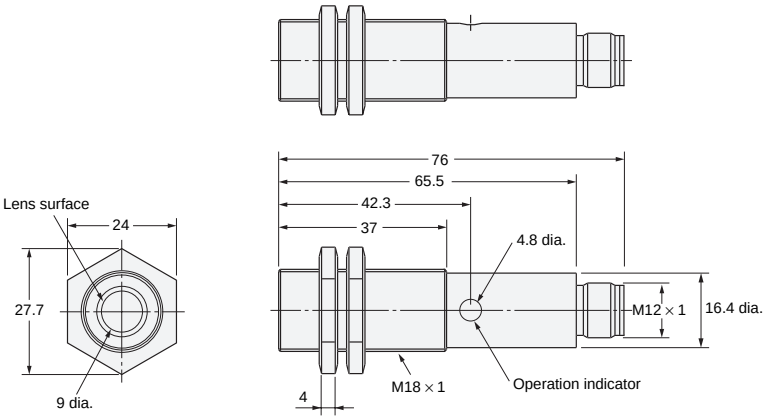



✻ Vinyl-insulated round cord with four Receiver conductors and three Emitter conductors, 4 dia. (cross sections of conductors: 0.2 mm$^2$, insulation system: 1.1 mm dia.)

### Connector with Metal Case

**E3FS-10B4-M1-M**






### Safety Controller

**F3SX**

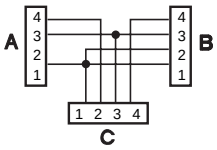
For details, refer to F3SX on page 652.

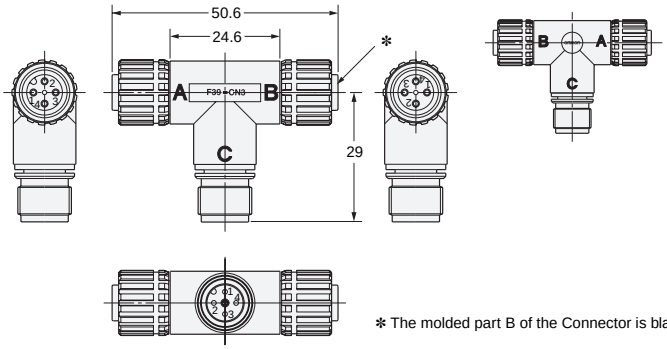
## Accessories (Order Separately)

### Branch Connector
**F39-CN3**



Wiring Diagram

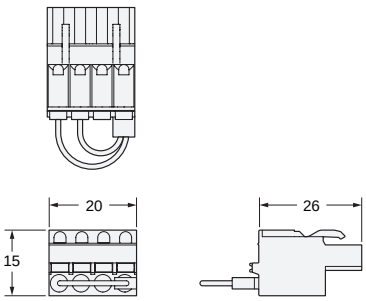



✻ The molded part B of the Connector is black.

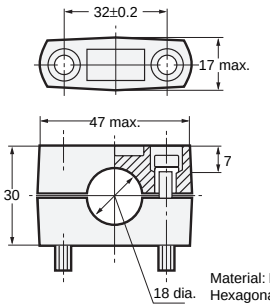
### Dummy Plug
**F39-CN4**






### Sensor Mounting Bracket (for E3FS)
**Y92E-B18**



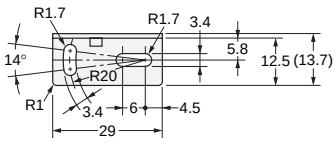


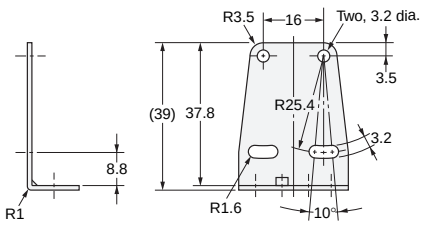

Material: Plastic
Hexagonal bolt: M5 x 32

### Sensor Mounting Bracket (for E3ZS)
**E39-L104**



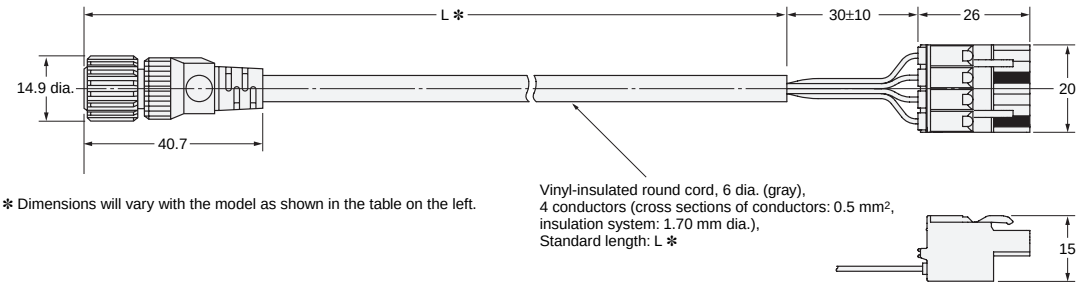
Material: Stainless steel (SUS304)



## Cables with Connectors on Both Ends for Branch Connection

**F39-JF1S**
**F39-JF2S**
**F39-JF5S**
**F39-JF10S**

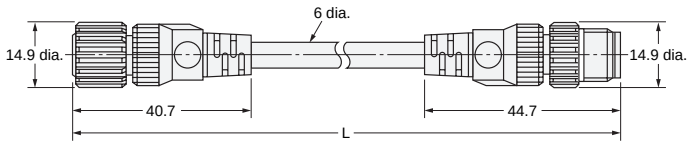



| Model | L (mm) |
|---|---|
| F39-JF1S | 1,000 $^{+150}_{0}$ |
| F39-JF2S | 2,000 $^{+150}_{0}$ |
| F39-JF5S | 5,000 $^{+300}_{0}$ |
| F39-JF10S | 10,000 $^{+300}_{0}$ |

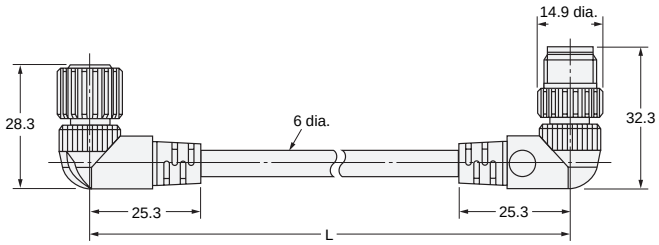
✻ Dimensions will vary with the model as shown in the table on the left.

## Cables with Connectors (Socket and Plug) on Both Ends

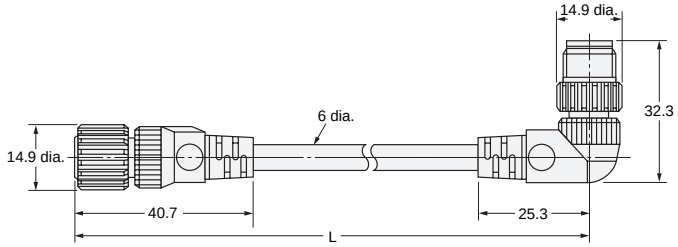
**XS2W-D421-C81-A (L=1m)**
**XS2W-D421-D81-A (L=2m)**
**XS2W-D421-G81-A (L=5m)**
**XS2W-D421-J81-A (L=10m)**
**XS2W-D421-C81-R (L=1m)**
**XS2W-D421-D81-R (L=2m)**
**XS2W-D421-G81-R (L=5m)**
**XS2W-D421-J81-R (L=10m)**



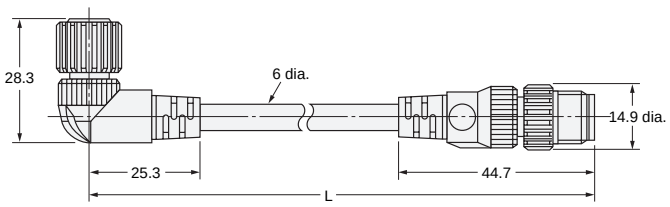

**XS2W-D422-D81-A (L=2m)**
**XS2W-D422-G81-A (L=5m)**




**XS2W-D423-D81-A (L=2m)**
**XS2W-D423-G81-A (L=5m)**

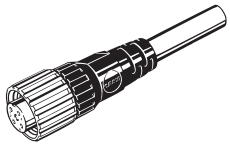


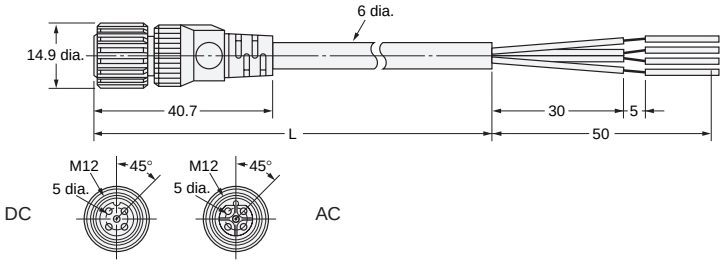

**XS2W-D424-D81-A (L=2m)**
**XS2W-D424-G81-A (L=5m)**



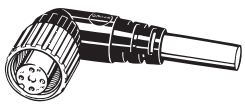
## Cables with Connector (Socket) on One End

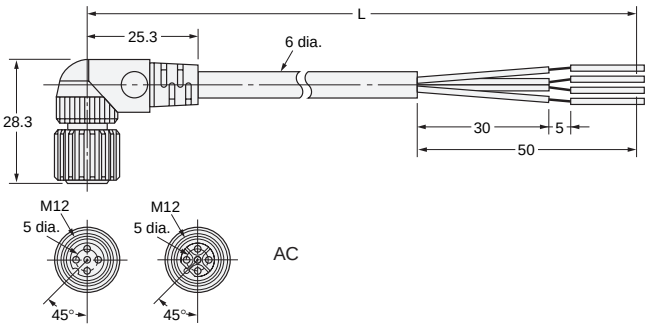
**XS2F-D421-C80-A (L=1m)**
**XS2F-D421-D80-A (L=2m)**
**XS2F-D421-G80-A (L=5m)**
**XS2F-D421-J80-A (L=10m)**
**XS2F-D421-C80-R (L=1m)**
**XS2F-D421-D80-R (L=2m)**
**XS2F-D421-G80-R (L=5m)**
**XS2F-D421-J80-R (L=10m)**





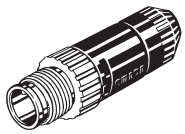

**XS2F-D422-C80-A (L=1m)**
**XS2F-D422-D80-A (L=2m)**
**XS2F-D422-G80-A (L=5m)**
**XS2F-D422-J80-A (L=10m)**
**XS2F-D422-C80-R (L=1m)**
**XS2F-D422-D80-R (L=2m)**
**XS2F-D422-G80-R (L=5m)**
**XS2F-D422-J80-R (L=10m)**

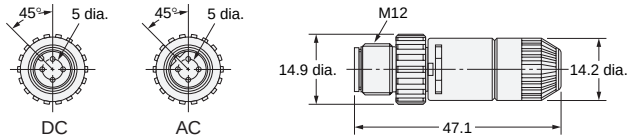




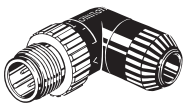

## Connector Plug Assemblies, Solder Type

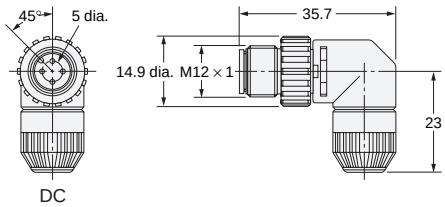
**XS2G-D425**





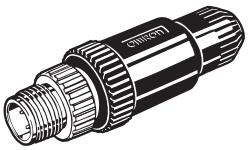

**XS2G-D426**

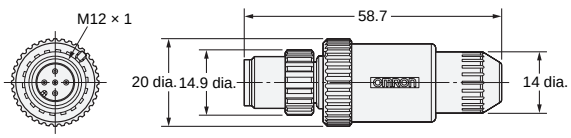




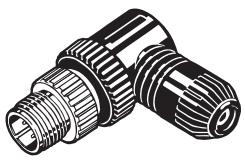

## Connector Plug Assemblies, Screw-on Type

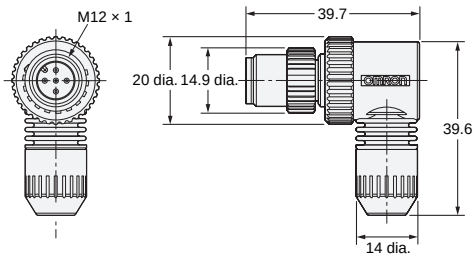
**XS2G-D4S5**






**XS2G-D4S6**





# Safety Precautions

**⚠ WARNING**

OMRON's Single-beam Safety Sensor Input Module (B1 Module) from the F3SX Series is the only Controller that can be used for the E3ZS-T81A/E3FS-10B4□□□ (type 2). Normal operation may not be possible if another Single-beam Sensor Controller is used.

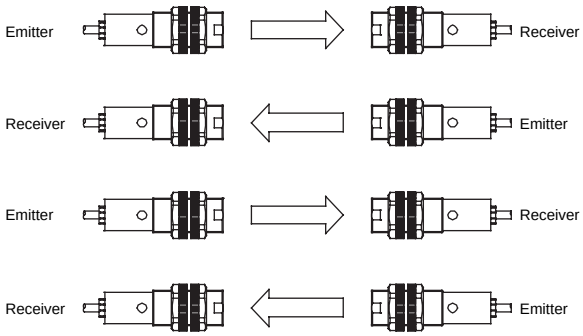
The Sensor cannot be used as part of a safety system when the mode selection input of the Single-beam Safety Sensor Receiver is connected to 0 V because the Sensor will turn ON when light is interrupted (Dark ON). Be sure to connect the mode selection input to 24 VDC if you want the Sensor to turn ON when light is incident (Light ON).

Refer to the "*Precautions for All Safety Sensors*" on page 242 for calculating the Safety distance.

## Preventing Mutual Interference

Observe the following items during installation to prevent Single-beam Safety Sensors from interfering with each other or with Safety Light Curtains.

- Leave adequate space between the Sensors during installation. (Refer to the instruction manuals for the E3ZS/E3FS and the F3SN/F3SH.)
- Use baffle plates to separate Sensors.
- Alternate Emitters and Receivers during installation. (See the figure below.)




Check for mutual interference between Single-beam Safety Sensors or Safety Light Curtains connected to the same or different Control Units before finalizing placement and starting normal operation.

**⚠ WARNING**

When installing multiple Safety Light Curtains, Multi-beam Safety Sensors, and Single-beam Safety Sensors, take necessary steps to prevent mutual interference. Otherwise detection may fail and serious injury may result.

**MEMO**

## Single-beam Safety Sensor for Long Distance Detection

# F3SS

## 60-m long-distance detection. This transmissive-type photoelectric sensor for human body detection (Type 4) is ideal for integrated protection of an entire line or multi-sided detection of intrusion into large machines.



- Mutual interference protection function for up to four sets.
- Complies with IEC standards and North American standards (received IEC61496-1, -2, and UL/CSA certification). Can be used as a safety guard for satisfaction of OSHA requirements for on-site labor safety in North America.
- Special controller not needed. Detection of human body intrusion is possible using just the sensor unit.
- Includes “Start/restart interlock function” to prevent automatic reset of output.
- The projector lens and receiver lens are equipped with heaters for worry-free operation even in environments where condensation easily forms.
- Optional glass and stainless steel mirrors are available.

⚠ Be sure to read the *“Safety Precautions”* on page 455 and the *“Precautions for All Safety Sensors”* on page 242.

## Ordering Information

### Sensors

Infrared

| Sensor type | Appearance | Case material | Connection method | Sensing distance | Output | Model |
|---|---|---|---|---|---|---|
| Through-beam |  | Aluminum | Connected to the terminal block on the internal board. | 0.3 to 60 m | PNP output | **F3SS-AT60P** |

**Note:** F3SS-AT60P-L Emitter and F3SS-AT60P-D Receiver can also be ordered individually.

### Accessories (Order Separately)

| Item | Model |
|---|---|
| Laser Alignment Kit (for beam alignment) | **F39-LLK** |
| Glass Mirror | **F39-MSG** |
| Stainless Steel Mirror | **F39-MSS** |
| 45° Mirror Clamp | **F39-LM45** |
| Mirror Clamp for Wall Mounting | **F39-LA** |
| Sensor Clamp for 42-mm-diameter Pipe Stand | **F39-LSP** |

**Note:** Wiring is based on a built-in terminal block. Please purchase a 4-mm to 7-mm (dia.) cable separately.

# Specifications

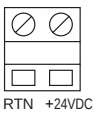
| Item / Model | F3SS-AT60P |
|---|---|
| **Sensor type** | Through-beam models |
| **Safety category** | Category 4, 3, 2, 1, or B |
| **Detection capability** | Opaque objects, 31 mm in diameter or greater |
| **Lens diameter** | Diameter 36 mm |
| **Sensing distance** | 0.3 to 60 m |
| **Response time (under stable light incident condition)** | 35 ms max. |
| **Startup waiting time** | 4 s or less |
| **Power supply voltage (Vs)** | 24 VDC ±10% (ripple p-p: 5% max.) |
| **Current consumption (no load)** | Emitter: 170 mA max.<br>Receiver: 800 mA max. |
| **Light source (emitted wavelength)** | Infrared LED (880 nm) |
| **Effective aperture angle (EAA)** | ±2.5° at 3 m |
| **Control outputs (OSSD)** | Two PNP transistor outputs, load current 250 mA or less (residual voltage 1 V or less) (excluding voltage drop due to cable extension) |
| **Output operation mode** | Light-ON |
| **Indicators** | Emitter: Power indicator (orange), error mode indicator (red)<br>Receiver: Light intensity level indicator (orange), OFF-state indicator (red), ON-state indicator (green), interlock indicator (yellow) |
| **Mutual interference prevention function** | Emitter Frequency Switch |
| **Safety functions** | Auto start mode, start interlock mode, and start/restart interlock mode can all be selected using a switch in the receiver. |
| **Connection method** | Connected to the terminal block on the internal board. |
| **Protective circuits** | Output load short and power supply reverse connection protection |
| **Ambient temperature** | Operating/Storage: 0 to 55°C (with no icing or condensation) |
| **Ambient humidity** | Operating/Storage: 35% to 95% (with no icing or condensation) |
| **Degree of protection** | IEC Standard IP65 |
| **Vibration resistance** | Malfunction/destruction: 10 to 55 Hz, amplitude 0.7 mm, 20 sweeps each in X, Y, and Z directions |
| **Shock resistance** | Malfunction/destruction: 100 m/s$^2$, 1,000 times each in X, Y, and Z directions |
| **Material** | Aluminum (case and cap) |
| **Weight (packed state)** | Approx. 2.5 kg (1 set) |
| **Accessories** | Set of mounting clamps, operation manual, caps for conduits |
| **Applicable standards** | IEC (EN) 61496-1 Type4 ESPE ✻1, IEC(prEN)61496-2 Type4 AOPD ✻2 |

**✻1.** ESPE (Electro-Sensitive Protective Equipment)
**✻2.** AOPD (Active Opto-electronic Protective Devices)

# Connections

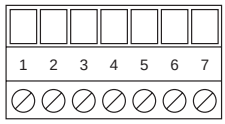
Wire the F3SS only after all power has been turned off.

### Emitter

| Terminal block number | Terminal name | Functions | Terminal block assignments |
|---|---|---|---|
| J3 | +24 VDC | +24 VDC |  |
| | RTN | 0V (GND) | |



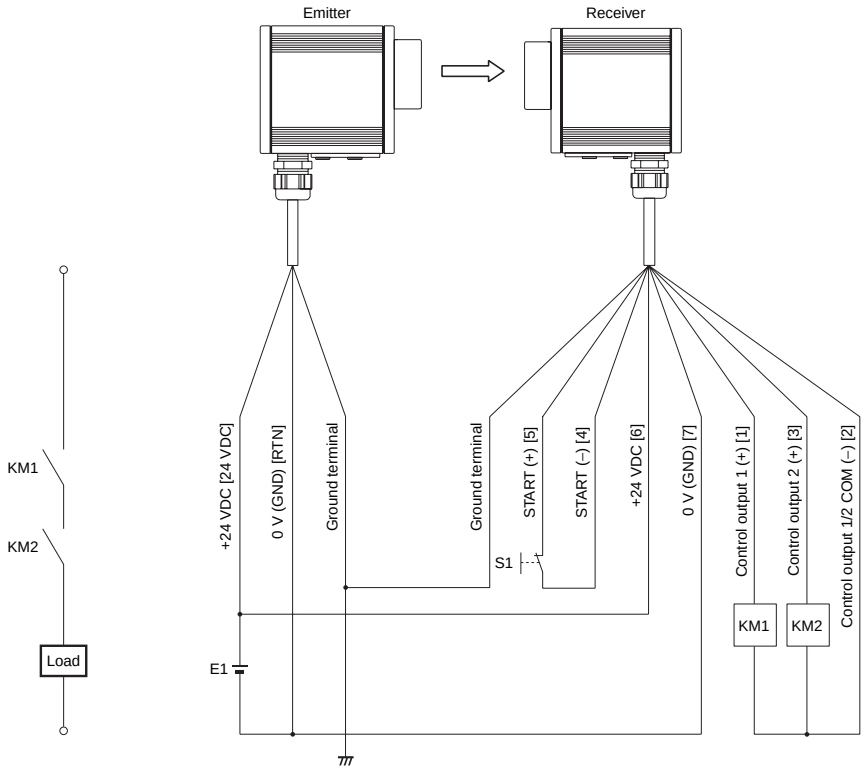
### Receiver

| Terminal block number | Terminal name | Functions | Terminal block assignments |
|---|---|---|---|
| J5 | 1 | Control output 1 (+) |  |
| | 2 | For control output 1/2 COM (-) | |
| | 3 | Control output 2 (+) | |
| | 4 | START(-) | |
| | 5 | START(+) | |
| | 6 | +24 VDC | |
| | 7 | 0V (GND) | |



**Note:** Ground the projector and receiver to the ground terminal inside the case.

## Start Interlock or Start/Reset Interlock Mode

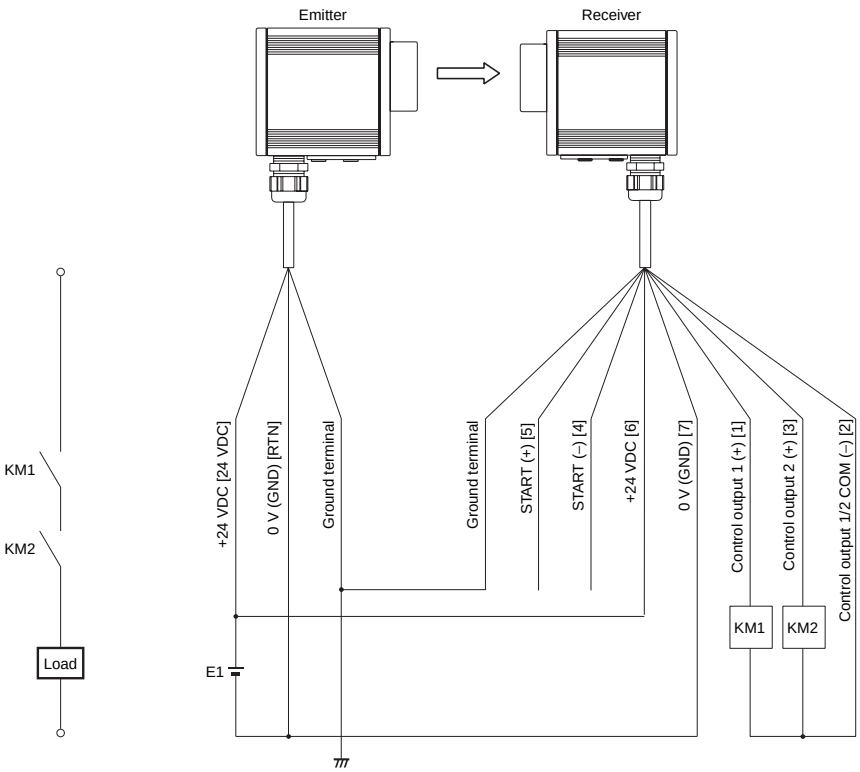



### Timing Chart

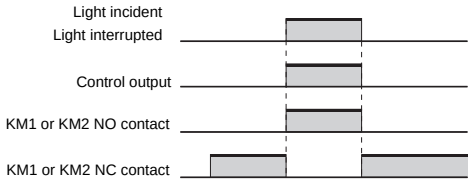



Terminal names or numbers are given in brackets [ ].
E1: 24-VDC power supply (recommended: S82K)
S1: Start switch (to release interlock): NC contact
KM1, KM2: DC-driven high-sensitivity contactors (e.g., J7AN)

## Auto-start Mode

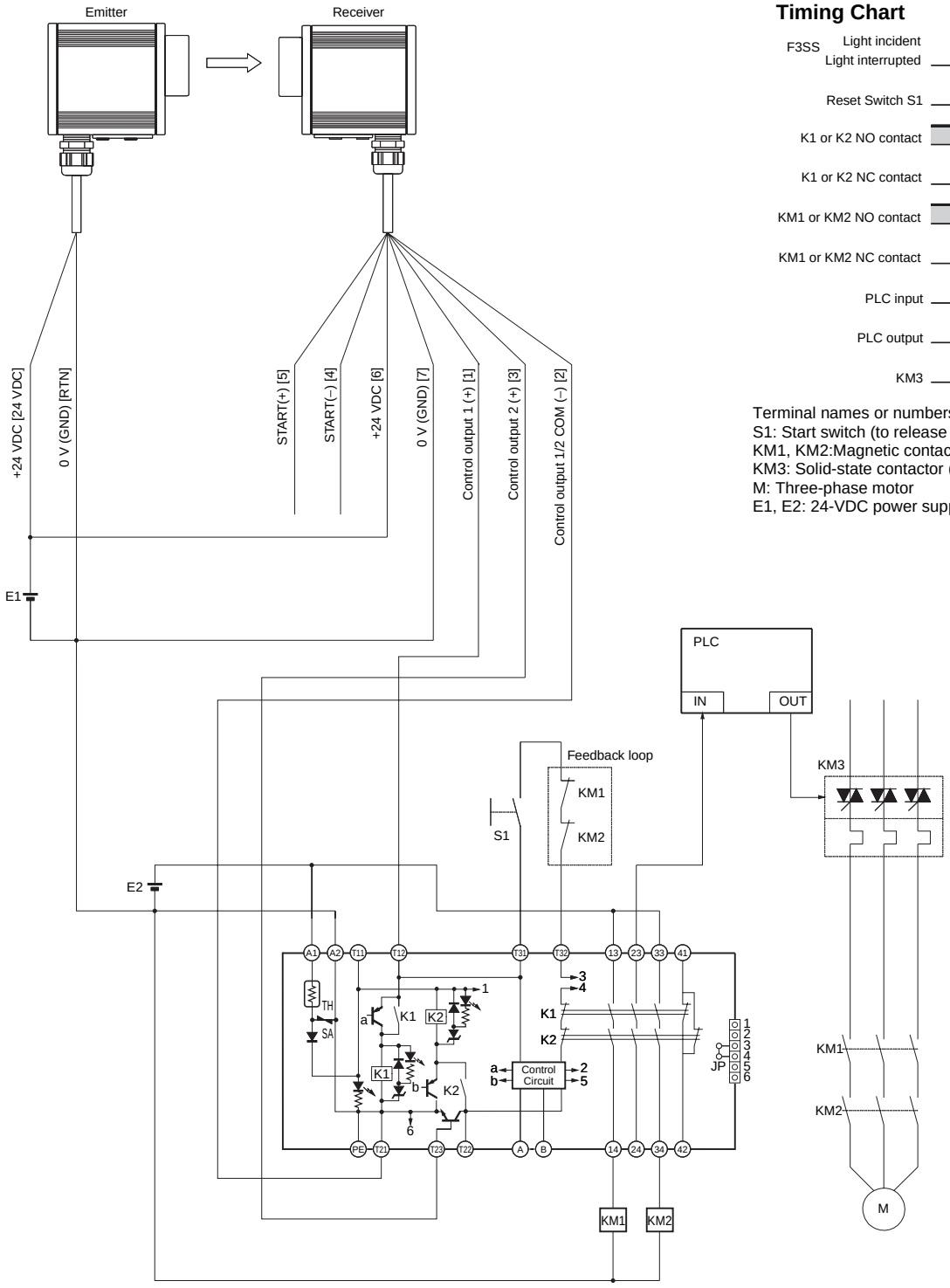



### Timing Chart

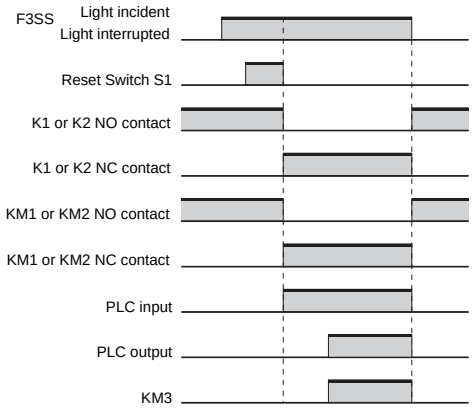



Terminal names or numbers are given in brackets [ ].
E1: 24-VDC power supply (recommended: S82K)
KM1, KM2: DC-driven high-sensitivity contactors (e.g., J7AN)

## Connection with OMRON G9SA-301 Safety Relay Unit (Category 4)




### Timing Chart




Terminal names or numbers are given in brackets [ ].
S1: Start switch (to release interlock): NC contact
KM1, KM2:Magnetic contactors
KM3: Solid-state contactor (e.g., G3J)
M: Three-phase motor
E1, E2: 24-VDC power supply (recommended: S82K)

**Note:** When connecting the F3SS to the G9SA-301, disable the F3SS's start/restart interlock function and use the interlock function in the G9SA-301 instead.

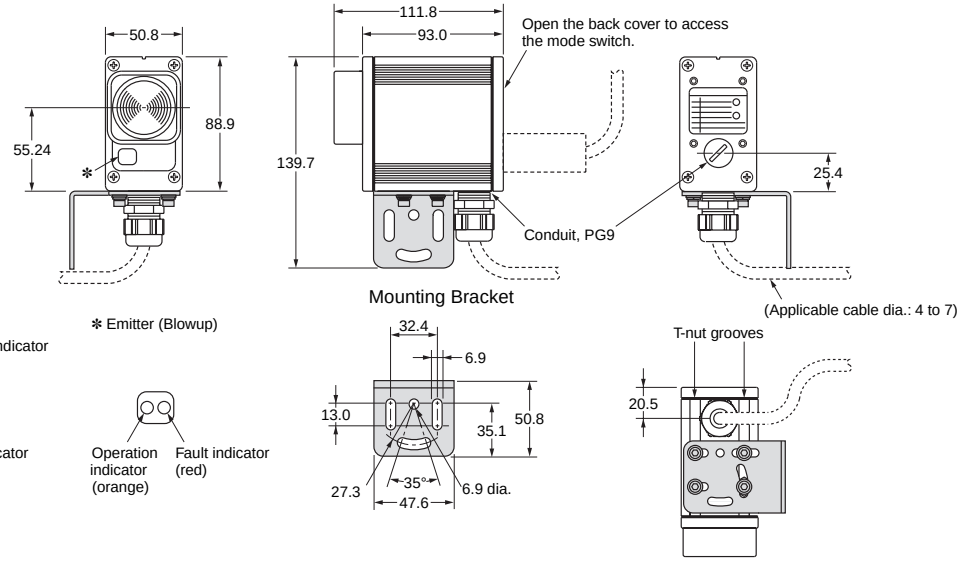
Refer to the *Instruction Manual* included with the product for details.

# Dimensions

(Unit: mm)

**F3SS-AT60P**





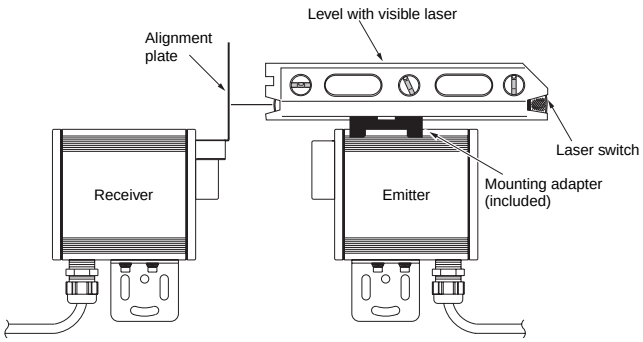

## Accessories (Order Separately)

### Laser Alignment Kit (for Beam Alignment)

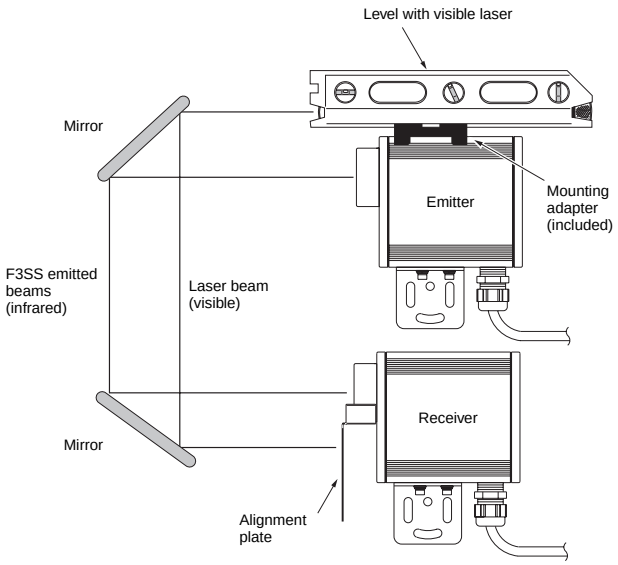
**F39-LLK**

The Laser Alignment Kit is used to align beams for long detection distances or when using Mirrors in the installation. A Level with a Visible Laser Beam is mounted on top of the Emitter and an Alignment Plate is mounted on the Receiver. First, the built-in levels are used to level the Emitter and Receiver and then the visible laser is turned ON. The heights and angles of the Emitter and Receiver are then adjusted so that the visible laser beam strikes the cross marks on the alignment plate. (Power supply: Three AA batteries, included in the Kit.)

**Not Using Mirrors or Using Mirror To Bend Beam Horizontally**




**Using Two Mirrors to Bend Beam at a Right Angle**

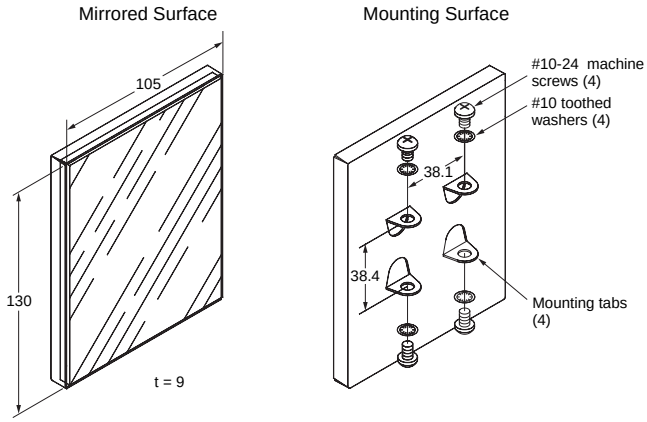



**Note:** The Laser Alignment Kit includes the alignment plate, level with visible laster, mounting attachment, and three AA batteries.

## Glass Mirror
### F39-MSG
## Stainless Steel Mirror
### F39-MSS

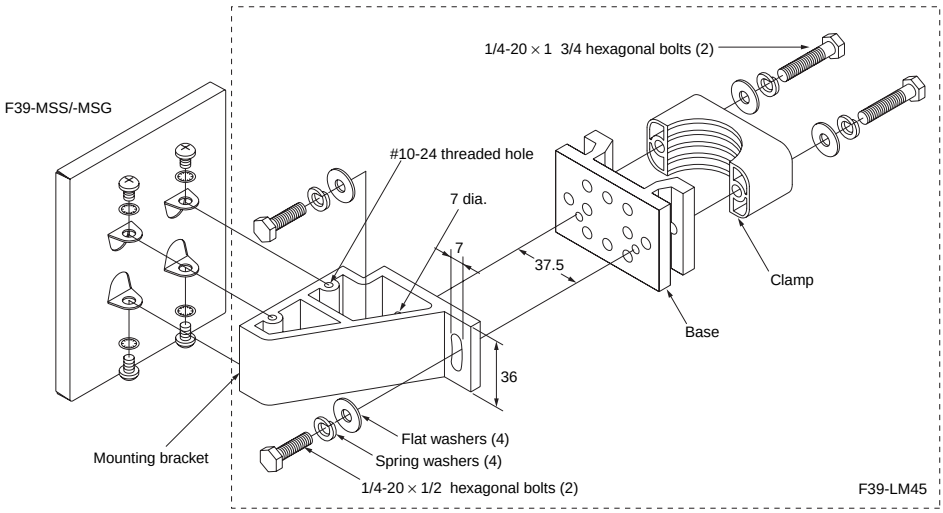
These Mirrors are used to bend the beams at 90° angles. Multiple Mirrors can be used to provide protection in two directions or to build a detection system with a 2-beam configuration.
There are two types of Mirror: Glass and Stainless Steel. The reflection rate of the Stainless Steel Mirror is lower, but there is no change of breakage.
The rate of attenuation in the detection distance is 12% for each F39-MSG Glass Mirror and 18% for each F39-MSS Stainless Steel Mirror. The detection distances according to the number of Mirrors used is given in the following table.

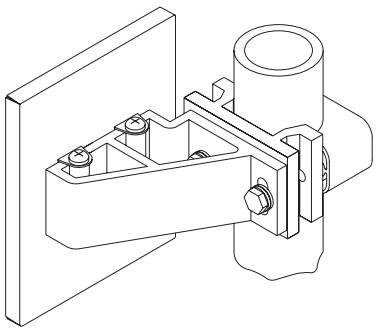
| Mirror material | Model | Detection distance (m) vs. No.of mirrors | | | |
|---|---|---|---|---|---|
| | | 1 Mirror | 2 Mirrors | 3 Mirrors | 4 Mirrors |
| Glass | F39-MSG | 52 | 46 | 40 | 35 |
| Stainless steel | F39-MSS | 49 | 40 | 33 | 27 |




## 45° Mirror Clamp (for F39-MSG/-MSS)
## F39-LM45

Use the F39-LM45 Mirror Clamp when mounting the F39-MSG/-MSS Mirror to a wall or pipe (dia.: 42 ±1). This Clamp enables mounting the Mirror at a 45° angle and bending the beam at a 90° angle.



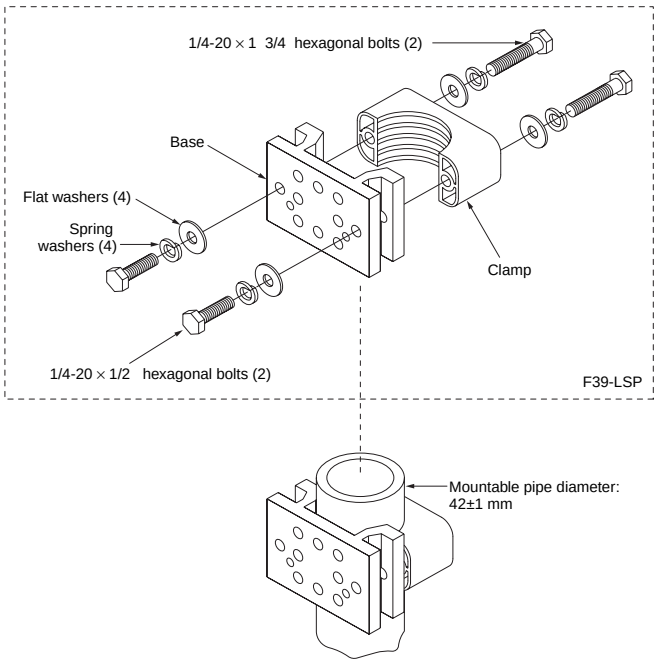
Assembled State

## Sensor Clamp for 42-mm-dia. Pipe Stand

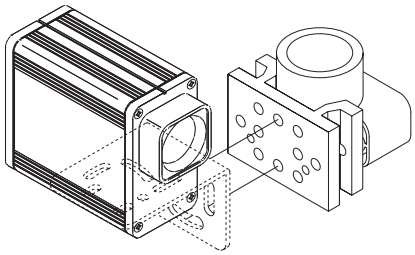
### F39-LSP

This Clamp is used to mount the F3SS Sensor to a pipe with a diameter of 42 ±1 mm.

### F39-LSP (Two Sets of Following Parts)




### Mounting Method Using Bracket Included with F3SS

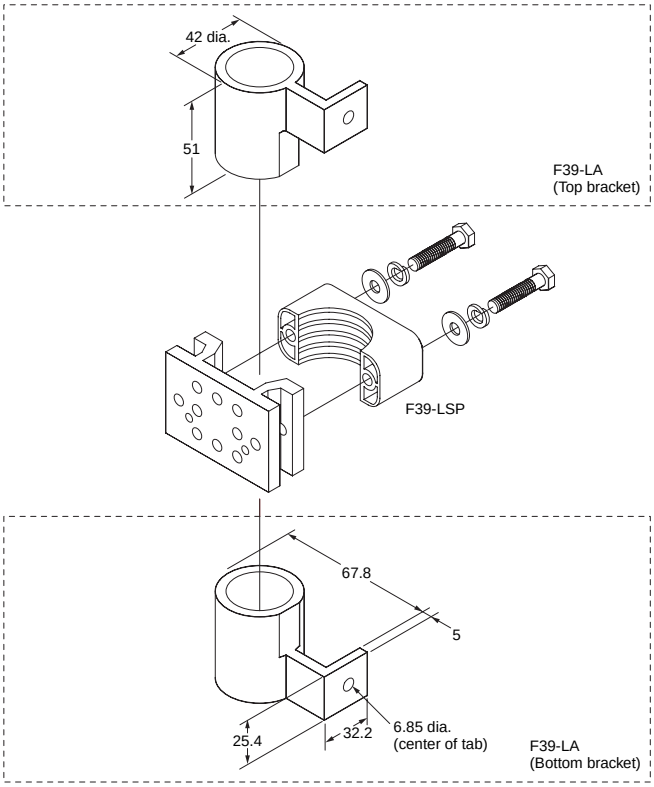


## Mirror Clamp for Wall Mounting

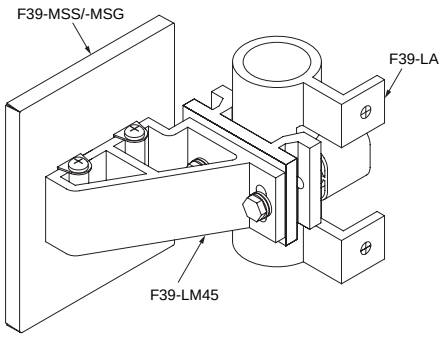
### F39-LA

This Clamp is used to mount the F39-LSP or F39-LM45 to a wall without using a pipe.

### F39-LA (Top and Bottom Brackets)




### Using the F39-LM45 and F39-LA to Mount the F39-MSS/-MSG Mirror to a Wall



# Safety Precautions

Observe the following precautions when using the F3SS.

## Regulations and Standards

The F3SS has not received the type certification provided by Article 44-2 of the Industrial Safety and Health Law of Japan.
Therefore, it cannot be used in Japan as a safety device for pressing or shearing machines provided by Article 42 of that law.

**⚠ WARNING**

### Safety Distance

Always maintain a safety distance (S) between the F3SS and a hazardous part of a machine.
Failure to do so causes the machine to fail to stop before an operator reaches the dangerous area and may result in serious injury.



Refer to the "*Precautions for All Safety Sensors*" on page 242 for calculating the Safety distance.

### Precautions for Safe Use

Do not used the product in atmospheres or environments that exceed product ratings.
Refer to the *Instruction Manual* for details on installation, connections, and operating methods.